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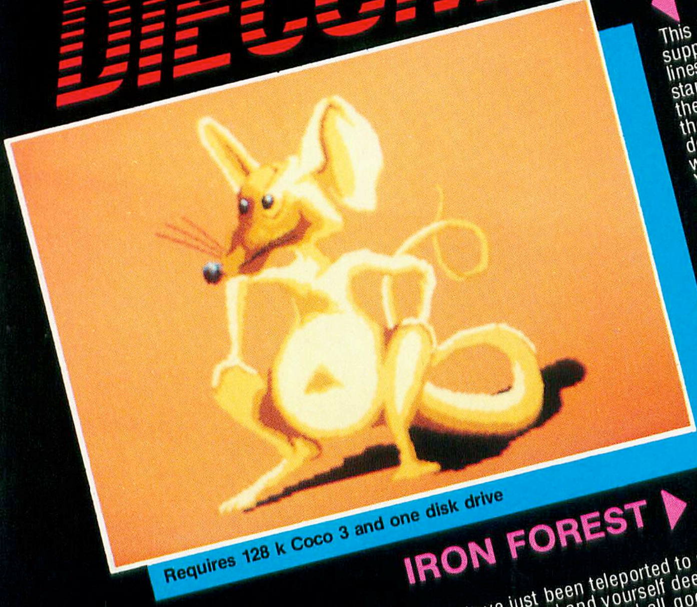

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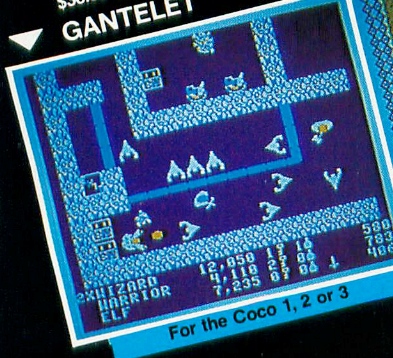

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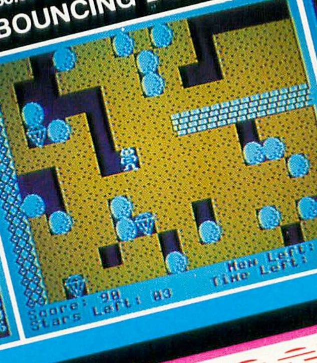

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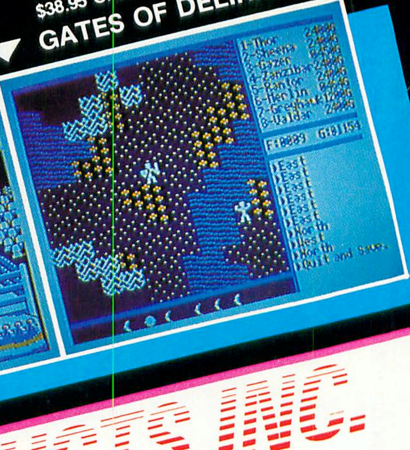

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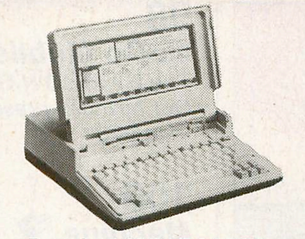

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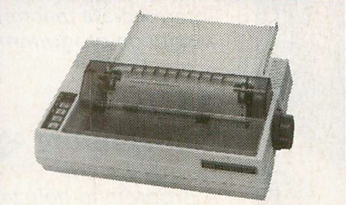

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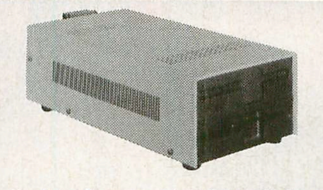

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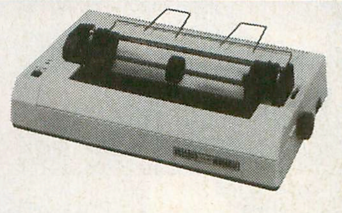

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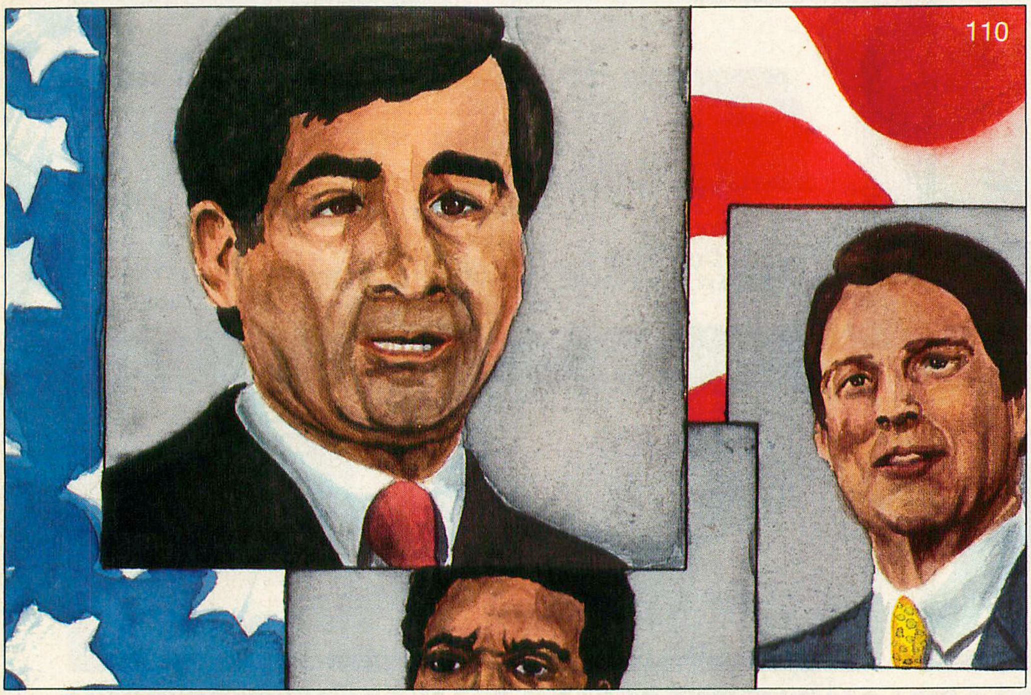

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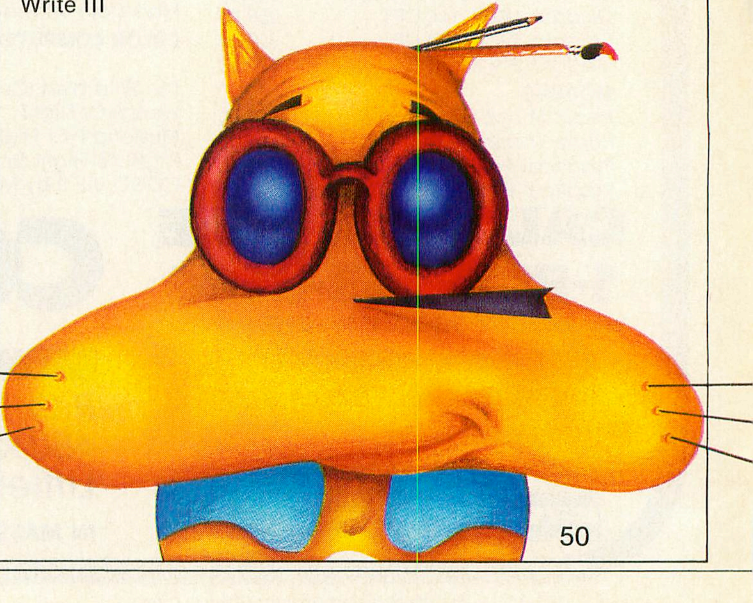

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The cassette tape/disk symbols beside features and columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE and RAINBOW ON DISK. Those with only the disk symbol are not available on RAINBOW ON TAPE. For details, check the RAINBOW ON TAPE and RAINBOW ON DISK ad on Page 104.

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Letters to the RAINBOW

Editor:

I would like to caution the CoCo Community about Trojan Horse, or virus, software. Virus software is designed to be unnoticeable when it is loaded from cassette or disk into a computer, while it slowly destroys the computer system. Viruses automatically start to change the data inside the computer. If a virus is in the computer system when someone saves a program to tape or disk, the virus "reproduces" by copying itself with the program, leaving just enough of itself to wreck the system.

Anyone with a computer at home, school or office is at risk, as are the nation and the world. Whole computer networks have been terminated because of virus software. Imagine what could happen if just one bank in the U.S. became a victim to virus software!

One way to check for a virus intrusion is to look at the time and date tables for each program on a disk (if these tables are available to you). A virus will instantly attack the time and date a program was saved to disk.

I certainly hope that the CoCo Community will be on the lookout for virus software. If the Community can pull together, maybe we can put an end to Trojan Horse software.

Jamie Stafford
Norton, OH

HINTS & TIPS

Editor:

My CoCo 3 had an overheating problem after I installed the 512K upgrade board. First I was told to use a fan to cool the computer. This seemed to solve my problem. Then one day I turned on my computer and got only a green screen. There was no sign-on message and no keyboard response. Pressing the reset button had no effect, either.

I took the cover off and removed the 512K RAM board, turned it over and noticed all the joints were cold-soldered. I resoldered all joints on the board, replaced it, and all is well. I don't even need a fan anymore.

Brad Stein
Winnipeg, Manitoba

A Subroutine Change

Editor:

I have tested the Hi-Res Joystick Interface ML subroutine [February 1988, Page 122] on my CoCo 2. It works very well with a simple one-byte change.

The first instruction is equivalent to the high-speed poke. It doubles the clock speed to make the routine more responsive. However, it is programmed for the CoCo 3, which goes high-speed when poked at `&HFFD9`. You must change it to `&HFFD7`. Simply `POKE &H7F02,&HD7` after the ML is in memory. If you are loading from `DATA` statements, change the third byte to `D7`.

Of course, the values returned are the coordinates for the CoCo 3 Hi-Res screen, which has 640 dots horizontally. To change the X-value to correspond to a 256-dot resolution, divide by 2, then set the result to 255 if it is greater.

If the high-speed clock causes any problems in your program (for example, if you are using the printer), simply `POKE &HFFD6,0` after the subroutine call.

Duane M. Perkins
Mt. Gretna, PA

Text Fix

Editor:

I've noticed that *TW-80* (my version anyhow) won't load anything other than an ASCII text file. This means it won't load an ASCII BASIC program or anything else without that filetype attribute.

I require this capability since I often include samples of BASIC code in my correspondence. I also consider it an annoying restriction.

Here's a fix in case you have that problem, too. Do this with a backup copy of your configured *TW-80* disk:

```
LOADM "DISKMENU"
PRINT (HEX$(PEEK(&H2285))
```

If the computer returns a 27, continue on: Otherwise, stop now, since your version isn't the same as mine.

If it returns 27 then

```
POKE &H2285,&H20
SAVEM "DISKMENU",&H2000,
&H381B,&H2000
```

Mike Ward
Coral Gables, FL

Converting the CM-4 RGB

Editor:

Your readers should be aware that many Radio Shack products are discontinued each year and that these SOWG (Sold Out When Gone) items are offered at incredibly reduced prices. For example, I bought a CD player (Model 2200) for $79!

I also picked up a CM-4 RGB monitor for $59. This unit originally sold for $299, and there may still be some around.

To convert it to a CoCo 3, you need to order the CM-8 monitor cable from Tandy National Parts (about $8). You also need the nine-pin female connector 276-1538 ($2.49) and hood 276-1539 ($1.99).

Hook up as follows:

CoCo 3	to CM-4	
7	2	Ground
1	3	R
2	4	G
3	5	B
5	8	Vertical sync
6	9	Horizontal sync

The CM-4 doesn't have audio, but for 60 bucks, who cares! The picture looks great!

Bob Ocean
Santa Rosa, CA

KUDOS

Editor:

Thanks to James A. Upperman for providing the excellent child protection program in the April 1988 issue of THE RAINBOW. Such a program is desperately needed in the world in which we live.

Using his example, the pediatrician for whom my wife works has implemented just such a standardized form. I'm sure that minor children everywhere will benefit.

Don Hutchison
Atlanta, GA

Support for the End User

Editor:

I recently had problems with two programs in your magazine. One was *VCR Tapes*, by Randy Mayfield, from the December 1987 RAINBOW (Page 92). The other was "Appointment Calendar" by Bill Holdorf (January 1988, Page 100). In both cases, I was able to contact the authors and explain my problems. Mr. Mayfield not only helped correct the problem, he sent a copy of an update. Mr. Holdorf also was very helpful; he, too, sent a copy of an update.

I recently sent for a program reviewed in one of your earlier issues — TOMELA*Co's *Bowling League Secretary* by Tom Bennett. I was having trouble getting it to print on my DMP-105 and contacted him. He worked with me and now it prints just fine.

I am sure you receive many letters from people saying the same things about other authors. It seems that just about all who publish or advertise a program in your magazine, whether individual or small company or large, seem to go the extra couple of miles to be of help.

Lastly, thank you for a very "user-friendly" magazine. I seem to go through my copy each month faster and faster. I then chomp at the bit until the next copy arrives. Thank you, Mr. Mayfield, Mr. Holdorf, Mr. Bennett and RAINBOW, for "making my months."

Richard Mullicane
Rancho Cordova, CA

INFO PLEASE

Editor:

I am a legally blind man with a cassette-based CoCo 2, which I purchased for use here at AEB (Arkansas Enterprises for the Blind). I have bought the Speech/Sound Pak to help me enter programs, with the

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hopes that it would allow me to type in lines of a program and have it echo text and error messages back to me. I am not able to read listings of long programs and type at the same time. Is there a machine language program that will work like *Echo* on the Apple?

I would also appreciate more information on machine language programming and any machine language projects to help me get started on the 6906E microprocessor. Radio Shack has no books available on the subject. I am ordering an assembler, but I need more than that. I need to see some ideas for programs and possibly more tips and tricks.

Mike Dalene
2811 Fair Park Boulevard
Little Rock, AR 72204

While it isn't exactly what you are looking for, Mike, check out "Yakety-Yak the CoCo Talks Back" (October 1987, Page 106). For assembly language, we refer you to the TEPCO advertisement for Assembly Language Programming for the TRS-80 Color Computer *and William Nee's series on assembly language which begins on Page 100 of this issue.*

Patch Needed

Editor:

A couple of years ago I purchased a graphics draw program called *VIZIDraw* that was a fine value for its cost. It was sold by GRAFX, P.O. Box 254-W, Mifflin, PA 15122. Since purchasing the CoCo 3, I have not been able to run the program. I have many important graphics pages saved and would like to see them again. Does anyone know of a patch for this program?

I have not had any success contacting the parent company. Perhaps it is no longer in business. Any help would be appreciated. I would very much like to buy the new *CoCo Max*, but I just don't want to forget all the graphics I have saved now.

Richard W. Zawatzke
6331 Taylor Ave.
Racine, WI 53403

Converting the Stick

Editor:

Where can I get an Atari-to-Color Computer joystick adapter and how much will it cost?

Clifford Lingle
7125 Glennwood
Overland Park, KS 66204

Copying Problems

Editor:

For some time now I have been looking, with no success, for a way to print out a hard copy of my *Micro Illustrator* files. One of my biggest difficulties is having almost no experience with OS-9. Is there any help for me, or am I just out of luck?

Also, just this year I purchased a disk drive; while converting my files to disk, I encountered a few problems. I can't seem to save *Madness and the Minotaur, Raaka-Tu* or *Pyramid*. When I try, I get an error. I've tried to save them with a terminal program, but when I try to load each program back to run it I get an FS Error. What do you suggest?

Also, I'm having trouble copying some of my ROM packs. I've followed the instructions from an older issue, but they don't seem to work on *Roman Checkers, Personal Finance II* and a few others. Is there any other way?

Paul A. Pritchett
Pleasure Bay, Apt. 6
Long Branch, NJ 07740

CoCo Record-Keeping

Editor:

I own a small exterminating company with about 75 customers. I would like some information or help in getting a program like some other exterminators' that is compatible for my Color Computer.

I have the CoCo 3 with 512K memory, two disk drives and a DMP-100 printer. I like this computer and don't want to get rid of it to get an IBM compatible, but due to the amount of writing I do to keep records and to fill out invoices and work orders, I may have to go this route.

I really hope you can help me.

Michael S. Richman
107-67 92nd Street
Ozone Park, NJ 11417

To BBS or not to BBS

Editor:

I am considering a hard disk and an auto-answer multi-baud modem for my 512K CoCo 3. I would like to set up my system as a 24-hour BBS, running under OS-9 Level II, but I do not want to lose the use of it for other things under OS-9. Also, I would like to be able to tailor the BBS to my needs and change it as I see the need. I would appreciate any comments, suggestions and information about software and hardware to accomplish this.

Andrew Cazier
10213 19th S.W.
Seattle, WA 98146

PEN PALS

- I am 10 years old and looking for a pen pal aged 7 through 15 who likes sports or playing games on the computer. I have a CoCo 3 and two disk drives.

Eddie Roginski
RD #1, Box 216
Mertztown, PA 19539

- I have a CoCo 3, FD-501 disk drive, DMP-130 printer and a cassette recorder. I am 14 years old and would welcome letters from all over the world.

Frank Ferrara
27200 Santa Ana
Warren, MI 48093

- I am 21 years old, have a CoCo 3, DMP-106 printer and CCR-81 cassette recorder. I am a Mexican student and would like to have pen pals from anywhere in the world.

Ubaldo Jimenez Yee
1933 D. Ave.
National City, CA 92050

- I would like to get to know some nice people who want to be my pen pal. I have a CoCo 3 with a Radio Shack disk system. I am 16 years old and I speak more French than English.

Laurent Toulet
3655 Ridgwood
Apt. 406
Montreal, Canada
H3V 1B4

- I'm 10 years old and have a CoCo 3 with printer and disk drive. I would like to have pen pals from all over the world.

Andrew Pinckston
Box 1228
Blind River, Ontario
Canada P0R 1B0

- I am basically a game and sports fanatic, not much interested in technical or programming stuff. I'm in my 30s and love to play with my CoCo 2 and disks. I need some help with some Adventures and will help you with improving game scores. Write soon.

J.K. Glass
410 E. Park Ave.
Long Beach, NY 11561

- I'm 15 and have a CoCo 3 with a disk drive, and I'm looking for pen pals (with a CoCo 3 and disk drive) all over the world (especially Canada). I love music, graphics and Simulations! Also, I'll answer all letters.

Roderick Clark
15215 Chaseridge
Missouri City, TX 77489

- I would like to have some pen pals anywhere in the U.S. I am 14 years old and have a 64K CoCo 2, a printer and a disk drive.

Andrew Cooper
311 Fern Drive
Atco, NJ 08004

- I am 16 years old and would like pen pals. I own a 64K CoCo 2, a 128K CoCo 3, two FD-500 drives, a CM-8 monitor, Multi-Pak Interface and DMP-105. I am interested in OS-9. Oh, one thing: Piraters, don't waste your stamps!

Heath Dingwell
RR #2, Box 230
Litchfield, CT 06759

- I am 36 years old and have the CoCo 2 with tape system. I just sent for the 64K upgrade. This is all new to me, but I love it. I would love to hear from pen pals of any age.

Freda Finch
RFD #2, Box 140B1
Ellsworth, ME 04605

- I'm 42 years old and enjoy horsing around with my computers, a Model III and a 64K CoCo with two drives, a graphics pad, DMP-105 and a Multi-Pak. I've done just about everything to these puppies but paint a sports stripe down the side of them. I know some German and Spanish and a microscopic bit of Russian and would like to correspond with anybody anywhere in any of these languages. No parameter/limits on age.

Richard Overstreet
3724 Broadway, Apt. 605
Kansas City, MO 64111

- I am 27 years old and have a CoCo 3. I am interested in pen pals who would like to develop strategy games for the CoCo 3. I work as a graphics design artist.

David Rubright
1015 Muscatine Ave.
Iowa City, IA 53340

BULLETIN BOARD SYSTEMS

- You're standing at a guarded bridge. In the distance you see an open market and beyond that the walled city of Karian. As you stand there a guard steps up and says, "What is thy name?" That's how *The Realm* Adventure System opens up. *The Realm* is a true fantasy role-playing Adventure board using software written specifically for this type of board. You'd have to see it to appreciate the uniqueness of the system. All users are given instant access to all features. The hours are 10 p.m. to 10 a.m. each day, plus additional hours posted on the board. The system supports 300 and 1200 baud and can be reached at (513) 251-4472.

Floyd Resler
2834 Lehman Rd.
Cincinnati, OH 45204

- I am happy to announce the arrival of my board, CoCo Brothers BBS (*CBBBS* Version 2.1A). It is currently running at 8-N-1, 300/1200 baud. Call between 9 p.m. and 9 a.m., C.S.T at (501) 562-4312.

Chris Bagnor
8701 I-30
Little Rock, AR 72209

- I would like to announce a new BBS in the Marysville and Yuba City calling area. *09-Online BBS* is my own BBS software running under OS-9 on a 512K CoCo 3. It is up 24 hours a day, 7 days a week at (916) 742-6835. The parameters for calling are 300 baud only with 8 bit, no parity and 1 stop bit.

Jim Vestal
1100 E. 17th St. #41
Marysville, CA 95901

- I am running a CoCo BBS whose hours are 9 p.m. to 6 a.m. seven days a week. Baud rates are 300/1200, and the phone number is (718) 335-4874.

Bob Zuckerman
P.O. Box 368
Jackson Heights, NY 11372-0368

- My system has been online since November 1985. System protocol includes a baud rate of 300/1200/2400, 24 hours at 8-N-1; 65.5 Mb disk space. Phone (608) 655-3806 or (608) 274-6922.

The system operates on a Tandy 1000 and supports all Tandy operating systems, including the Color Computer.

The system also supports a very large Ham Conference and is open to the public.

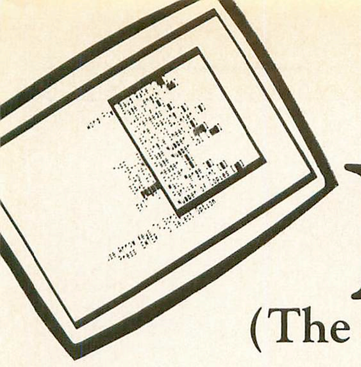
Francis Selje (SysOp)
P.O. Box 514
Marshall, WI 53559

- Announcing the birth of a new CoCo SIG on *Starbase BBS*, featuring a CoCo conference, large upload/download base, online games and CoCo support! Call (806) 745-9167.

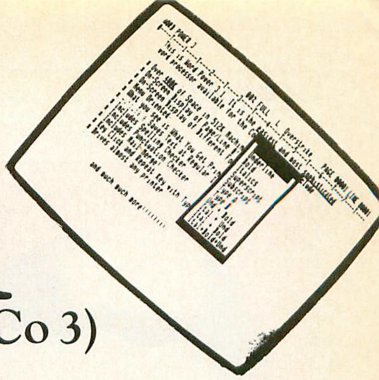
Lance Johnston
3510 27th St.
Lubbock, TX 79410

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type `RAI` to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type `LET` to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.



Word Power 3.1



(The Ultimate Word Processor for the CoCo 3)

Power Unleashed! Unlike other word-processors, Word Power 3.1 is written from scratch for the CoCo 3. It bridges the gap between "what is" and "what should be" in word-processors. **No other word processor offers such a wide array of features that are so easy to learn and use.**

DISPLAY

The **80-column display** with true lowercase lets you view the full width of a standard page. **All prompts are displayed in plain English in neat colored windows (see display above).** The current column number, line number, page number and percentage of free memory is displayed on the screen at all times. The program even **displays the bottom margin perforation** so you know where one page ends and the other begins. You can also change foreground/background color of screen and select menu and carriage return colors to suit your needs! Carriage returns can be visible or invisible. Word Power 3.1 runs at double clock speed and can be used with RGB/composite/monochrome monitors as well as TV.

AVAILABLE MEMORY

No other word processor gives you so much memory. Word Power 3.1 gives you **over 72K** on a 128K machine and **over 450K** on a 512K machine to store text.

EDITING FEATURES

Word Power 3.1 has one of the **most powerful and user-friendly full-screen editors with word-wrap.** All you do is type. Word Power 3.1 takes care of the text arrangement. It even has a built-in **Auto-Save** feature which saves the current text to disk at regular intervals; so you know that your latest version is saved to disk. Here are some of the impressive editing features of Word Power 3.1:

Insert/Overstrike Mode (Cursor style changes to indicate mode); OOPS recall during delete; **Type-ahead buffer** for fast typers; Key-repeat (adjustable) and Key-click; Four-way cursor control and scrolling; Cursor to beginning of text, end of text, beginning of line, end of line, top/bottom of screen, next/previous word; Page up/down; Delete character, previous/next word, beginning/end of line, complete line, text before and after cursor; Locate/Replace with **wild-card search** with auto/manual replace; Block Mark, Unmark, Copy, Move and Delete; Line Positioning (Left/Center/Right); Set/Reset 120 programmable tab stops; Word count. Define left, right, top and bottom margins and page length. You can also highlight text (underline— with **on-screen underlining,** bold, italics, superscripts, etc). Word Power 3.1 even has a **HELP screen** which can be accessed any time during edit.

MAIL-MERGE

Ever try mailing out the same letter to 50 different people or sending out several resumes? Could be quite a chore. Not with Word Power 3.1. Using this feature, you can type a letter, follow it with a list of addresses and have Word Power 3.1 print out personalized letters. It's that easy!

SAVING/LOADING TEXT

Word Power 3.1 creates ASCII format files which are compatible with almost all terminal, spell-checking and other word-processing programs. It allows you to load, save, append and kill files and also to create and edit Basic, Pascal, C and Assembly files. You can select files by simply cursoring through the disk directory. Supports double-sided drives and various step rates.

PRINTING

Word Power 3.1 drives almost any printer (DMP series, EPSON, GEMINI, OKIDATA, etc). Allows print options such as baud rates, line spacing, page pause, partial print, page numbers, page number placement, linefeed option, multi-line headers/footers, right justification and number of copies (see display above). The values for these parameters and the margins can be changed anytime in the text by embedding Printer Option Codes. Word Power 3.1 has the **WHAT YOU SEE IS WHAT YOU GET** feature which allows you to preview the text on the screen as it will appear in print. You can see margins, page breaks, justification and more.

SPELLING CHECKER

Word Power 3.1 comes with a 50,000 word spelling checker/dictionary which finds and corrects mistakes within your text. You can add words to or delete from the dictionary or create a dictionary of your own.

PUNCTUATION CHECKER

This checker will **proofread your text for punctuation errors** such as capitalization, spaces after periods/commas, double words and much more. It's the perfect addition to any word processor.

DOCUMENTATION

Writing with Word Power 3.1 is a breeze. Word Power 3.1 comes with a well-written, easy-to-comprehend instruction manual which will lead you step-by-step through the program.

Word Power3.1 comes on an UNPROTECTED disk and is compatible with RS DOS 1.0/1.1 and ADOS. Only $79.95.

(Word Power 3 owners can get the 3.1 version by sending proof of purchase and $10.00 to cover the cost of shipping and the manual.)

I purchased your Word Power. It arrived in time for my 13 year old daughter to process her history fair project. Word Power was easy to use and the features beat the heck out of the other word processors we were using.

KBG Tallahassee / Florida

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Fairport, NY 14450
Phone (716) 223-1477

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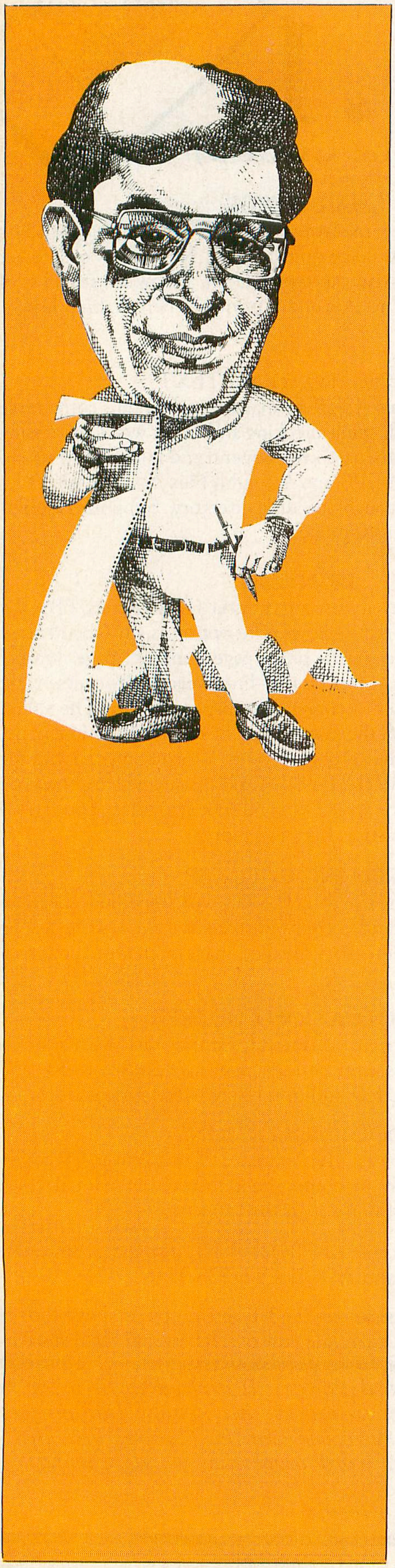

The Dream Machine

This is the 85th issue of THE RAINBOW. Seven years! What started out as a part-time venture has, as you all know, become a more-than-full-time business.

And, yes, as a business we have to do all the things that businesses do — prepare budgets, meet deadlines, set up policies and the like. But somehow, THE RAINBOW is different.

Someone once told me at a RAINBOWfest that it was a shame I could run a business and still enjoy playing with my CoCo. I guess he was right, and that is what makes this "different."

But there is something else, too. My mail will, I think, give you some insight to what I'm talking about.

* * *

The first letter comes from Massachusetts and contains a clipping of a newspaper article from *The Berkshire Eagle* of Pittsfield. It features a picture of Fred Scerbo and announces that Fred has been named a recipient of one of only seven statewide Distinguished Service Awards from the state's Interscholastic Athletic Association.

Fred, you see, is an assistant wrestling coach. That is a volunteer job at Drury High School, where Fred is a special needs teacher. As most of you know, he is one of our regular columnists and has been for years.

We've visited by phone many times. Often, he has mentioned that he's been working with this student or that on the CoCo, and how the computer provided an interest in something other than "trouble" for scores of youngsters in his area.

Indeed, it was the Color Computer that contributed to Fred's award. He set up a program to do the time-consuming job of setting pairings for wrestling tournaments. A number of associations in his area use those pairings.

COCO 3 UTILITIES GALORE

(All utilities support 40/80 columns for CoCo 3)
(CoCo 2 versions are available for most utilities)

SUPER TAPE/DISK TRANSFER

- Disk-to-Disk Copy (1-3 passes)
- Tape-to-Disk Copy
- Tape-to-Disk Automatic Relocate
- Disk-to-Tape Copy
- Tape-to-Tape Copy

Copies Basic/ML programs and DATA files. CoCo 1, 2 & 3. 32K Disk System (Disk to Disk Copy requires 64K). Disk Only **$24.95**

CoCo CHECKER

Something possibly wrong with your CoCo? CoCo Checker is the answer! Will test your ROMs, RAMs, Disk Drives & Controller, Printer, Keyboard, Cassette, Joysticks, Sound, PIAs, VDG, Internal Clock Speed, Multi-pak Interface and more! **$24.95**

DISK UTILITY 2.1A

A multi-featured tool for USER FRIENDLY disk handling. Utilize a directory window to selectively sort, move, rename & kill file entries. Lightning fast Disk I/O for format, copy & backup. Single execution of both Basic & ML programs. 64K DISK **$29.95** NOW also CoCo III compatible! Upgrade only **$15** w/proof of purchase.

COCO NEWSROOM

Now available for the CoCo III! You can design your own newspaper with Banner Headlines/6 articles using sophisticated Graphics, Fonts and Fill Patterns. Comes with 22 fonts & 50 pictures! Over 140K of code. Disk only **$49.95**

MAILLIST PRO

The ultimate mailing list program. Allows you to add, edit, view, delete, change, sort (by zipcode or name) and print labels. Its indispensible! Disk Only **$19.95** (CoCo 2 version included)

DISK LABEL MAKER

Allows you to design professional disk labels! Allows elongated, normal and condensed format for text, double-strike, border creation and multiple-label printing. Its a MUST for any user with a disk drive. Disk Only **$19.95.** Supports DMP 105/110/120/130/430, GEMINI, STAR, EPSON and compatibles. (CoCo 2 version included)

COMPUTERIZED CHECKBOOK

Why bother with balancing your checkbook? Let the CoCo do it for you! Allows you to add, view, search, edit, change, delete and printout (in a table or individual entry format) checkbook entries. Updates balance after each entry. Allows files for checking, saving and other accounts. Disk Only **$19.95** (CoCo 2 version included)

BOWLING SCORE KEEPER

An excellent utility to keep track of your bowling scores. Allows you to save scores under individuals or teams. You can edit, change, delete and compare scores. A must for anyone who wants to keep track of his or her bowling performance. Disk **$19.95** (CoCo 2 version included).

VCR TAPE ORGANIZER

Organize your videocassettes with this program! Allows you to index cassettes by title, rating, type, play time and comments. Also allows you to sort titles alphabetically and view/print selected tapes. If you own a VCR, this program is a must. Disk Only **$19.95** (CoCo 2 version included).

SCREEN DUMP

NEW

32, 40, 80 column text dump, PMODE 4 Graphics Dump. Single Keystroke Operation allows you to take snapshots of screens even when programs are running! Works on DMP's, Epson and Gemini. CoCo 1, 2 and 3. Disk Only **$24.95**

HOME BILL MANAGER

NEW

Let the CoCo keep track of your bills. Allows you to enter bills under various categories and reminds you when they are due. Disk Only. **$19.95**

CALENDAR MAKER

NEW

Generate monthly calendars on your printer for any year in the 20th century. Disk Only. **$19.95**

COCO UTIL II

(Latest Version): Transfer CoCo Disk files to IBM compatible computer. Transfer MS-DOS files to CoCo. Req. 2-Drive IBM compatible. **$39.95**

ADOS3

Advanced Disk Operating System for CoCo 3. **$34.95 ADOS $27.95**

SPIT'N IMAGE

Makes a BACKUP of ANY disk. **$32.95**

RGB PATCH

Displays most games in color on RGB monitors. For CoCo 3 Disk. **$24.95**

OS 9 PRODUCTS

OS 9 LEVEL II OPERATING SYSTEM

NEW

Supports 512K RAM dual speed, multi-tasking, multiple windows and more! Comes with disk and complete documentation. Only **$89.95**

MULTI-VUE

User friendly graphics interface with multiple "window" applications for Level II. Only **$54.95**

WIZ

OS9 Level II Terminal Package with 300-19200 baud rate and windowing capability. Requires 512K and RS-232 Pack. Only **$79.95**

SCREEN STAR

Best OS9 Word Processor. Implements WordStar (R) editing capabilities. Even has a built in spelling checker. Use with OS-9 Text Formater to get beautiful printouts. For OS9 Level 1 and 2. Disk Only **$49.95. OS-9 Text Formatter: Printout beautiful documents from any ASCII file. Only $34.95. Both Screen Star and OS-9 Text Formatter: $74.95**

DATA MASTER

Excellent database for OS9. Features include: windows, pull down menus, sorting, etc. Requires OS9 Level II & 512K. Only **$64.95**

PC-Xfer UTILITIES

NEW

Programs to format and transfer files to/from MS-DOS diskettes on CoCo Under OS9 Level 1 or 2. Requires SDISK or SDISK3. Only **$44.95**

SDISK 3

NEW

Standard disk drive module replacement allows full use of 40/80 track double sided drives. Req. OS9 Level II. Only **$29.95**

SDISK

NEW

Same as SDISK 3 except for OS9 Level I. Only **$29.95**

OS9 LEVEL II RAMDISK

Lightning Fast Ramdisk with Auto Formatting. A must for any OS9 Level II User. Req. 512K **$29.95.** (Only **$14.95** with purchase of 512K Upgrade & Ramdisk!!).

BOOKS

Inside OS9 Level II: $39.95
Rainbow Guide To OS9 Level II: $19.95
Rainbow Guide To OS9 Level II Disk: $19.95

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Please stop for a moment and think of the number of lives Fred Scerbo has touched through his work with his CoCo. Of course, there are so many of you who use his programs month in and month out from these pages. There are all those youngsters who found a computer was just as interesting as "trouble." And there are all those young people who have benefited through his coaching and *his pairings* program.

* * *

My other letter comes from someone who started into the CoCo business with a small advertisement in THE RAINBOW back in December and then repeated the ad in February of this year.

"Just when I thought I'd exhausted my buying audience I decided to give it one more shot and put an ad in the May issue," he wrote. "Now I'm so swamped with orders I don't have time to do any new 'recreational computing.' It's both a blessing and a curse."

The letter ends: "I guess what I'm getting at is this: I've been poor and unknown and I've been rich and famous (at least in CoCo circles). I prefer the latter. Thanks."

* * *

I am not going to identify this writer — or the first one who tipped me off to Fred Scerbo's latest accomplishment — because the names are not necessary. Rather, I think I want to spend just a moment of your time before you wade into everything in this issue (or set out to construct the CoCo mobile, our Anniversary gift to you) to think about both these letters and what they mean.

To both Fred and our newly famous advertiser, the CoCo has become the dream about which stuff is made. Whether it is a way to help youngsters or to help make a profit, this wonderful little machine is, in reality, a great big dream machine.

Forget the letters. Think about yourself. I'll bet CoCo has opened doors for you, too. Isn't that marvelous? I think so.

Our cover this month is a takeoff on a well-known motion picture. Is that a Color Computer along with Dorothy and her friends on the Yellow Brick Road? They seem to be traveling somewhere over the Rainbow to the land where wishes and dreams come true.

We are all traveling that same road.

Thank you for letting us be with you for seven years now. And wish us at least seven more!

— Lonnie Falk

One-Liner Contest Winner . . .

This one-liner will turn your CoCo and printer into a typewriting team. A restriction: The text strings you give the program must be in chunks of 80 characters or less.

The listing:

```
100 CLS:CLEAR1000:PRINT@0+9,"MIN
I SCRISIT":PRINT"WHAT WOULD' YOU
LIKE TO BE PRINTED":INPUTA$:PRIN
T@354+12,"PRINTING......":PRINT#
-2,A$:PRINT@356+8,"<<<<PRINTED>>
>>":PRINT@384+16,"AGAIN":PRINT@4
16+12,"(Y=YES/N=NO)":INPUTB$:IFB
$="Y"THENCLS:IFB$="Y"THEN100:
```

Danny White
Chicago, IL

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

E.Z. FRIENDLY For Your CoCo 1, 2, & 3

RAINBOW CERTIFICATION SEAL

Leonardo's Pencil

(Reviewed in Oct. 87 RAINBOW) Makes programming sensational-looking graphics as easy as moving a joystick! Converts precision drawings into "DRAW" commands which can be stand-alone BASIC programs or merged into other programs. Also includes "DEMO" and "PAINT" programs. Requires a spring-centered joystick or touch-pad. 32k ECB **tape or disk $14.95**

?ENIGMA?

Transform your computer into an ultra-secret code machine capable of enciphering and deciphering in over 12 million virtually unbreakable codes! (not simple substitution codes). Print hard copy or store & retrieve coded data on tape or disk. Only the person who has the password can read it! 32k ECB **tape or disk $12.95**

New! EZ Writer

Just answer the prompts & type your message; "EZ WRITER" will put it into perfect letter form and send it to your DMP or DWP. Professional-quality, single-page letters every time! Do one letter or multiple copies for "personalized" mailings. Saves letters and mailing lists. Even does labels. Menu-driven. Undoubtedly the EZ-est letter writing system available! Free sample on request! 32k ECB **tape or disk $19.95**

EZ MATH PACKAGE

FOUR superior educational "games": "RACEWAY", "GO TO THE TOP" (multiplication tables drill), "WORD PROBLEMS", & "PYRAMID". Covers addition, subtraction, multiplication, & division. Different levels of difficulty. Exciting graphics & sounds. EZ and fun! 32k ECB **tape or disk $19.95**

KEYBOARD COMMANDER New!

Probably the most exciting typing tutor available for your CoCo. You are the commander of a space ship & it's your job to shoot down alien letters & words as they speed toward you & attack your spaceship. Exciting Hi-Res action! 32k ECB **tape or disk $24.95**

E.Z. FRIENDLY SOFTWARE

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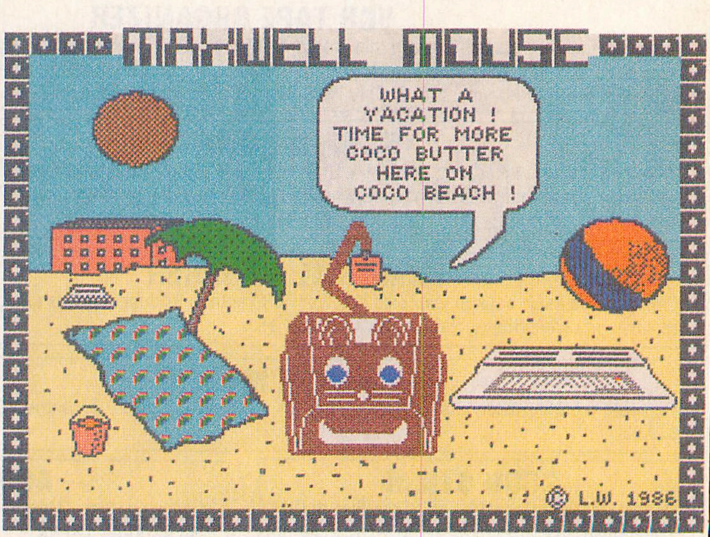
(Add $1.50 s/h to all orders. NY residents add state sales tax.)

Mouse Tales


MAXWELL MOUSE
WHAT A VACATION ! TIME FOR MORE COCO BUTTER HERE ON COCO BEACH !
© L.W. 1986

By Logan Ward

500 POKEs, PEEKs, 'N EXECs

FOR THE TRS-80 COCO

NEVER BEFORE has this information of vital significance to a programmer been so readily available to everyone. This book will help you 'GET UNDERNEATH THE COVER' of the Color Computer and develop your own HI-QUALITY Basic and ML programs. SO WHY WAIT??

This 80-page book includes POKEs, PEEKs and EXECs to:

- ★ Autostart your basic programs
- ★ Disable Color Basic/ECB/Disk Basic commands like LIST, LLIST, POKE, EXEC, CSAVE(M), DEL, EDIT, TRON, TROFF, PCLEAR, DLOAD, RENUM, PRINT USING, DIR, KILL, SAVE, LOAD, MERGE, RENAME, DSKINI, BACKUP, DSKI$, and DSKO$.
- ★ Disable BREAK KEY, CLEAR KEY and RESET BUTTON.
- ★ Generate a Repeat-key.
- ★ Transfer ROMPAKS to tape (For 64K only).
- ★ Set 23 different GRAPHIC/SEMIGRAPHIC modes
- ★ Merge two Basic programs.
- ★ AND MUCH MUCH MORE!!!

COMMANDS COMPATIBLE WITH 16K/32K/64K/COLOR BASIC/ECB/DISK BASIC SYSTEMS and CoCo 1, 2, & 3.

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SUPPLEMENT to 500 POKES, PEEKS 'N EXECS

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Rainbow Info

How To Read Rainbow

When we use the term CoCo, we refer to an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

The BASIC program listings printed in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little disk and/or cassette symbols on the table of contents and at the beginning of articles indicate that the program is available through our RAINBOW ON DISK or RAINBOW ON TAPE service.

Using Machine Language

The easiest way to "put" a machine language program into memory is to use an editor/assembler, a program you can purchase from a number of sources. All you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of putting an ML listing into CoCo is called "hand assembly" — assembly by hand, which *sometimes* causes problems with `ORIGIN` or `EQUATE` statements. You ought to know something about assembly to try this.

Use the following program if you want to hand-assemble ML listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I, VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the `&H3F00` in Line 10 to `&H7F00` and change the value of `I` to `&H7F80`.

OS-9 and RAINBOW ON DISK

The OS-9 side of RAINBOW ON DISK contains two directories: `CMDS` and `SOURCE`. It also contains a file, `read.me.first`, which explains the division of the two directories. The `CMDS` directory contains executable programs and the `SOURCE` directory contains the ASCII source code for these programs. BASIC09 programs will only be offered in source form so they will only be found in the `SOURCE` directory.

OS-9 is a very powerful operating system. Because of this, it is not easy to learn at first. However, while we can give *specific instructions* for using the OS-9 programs, you will find that the OS-9 programs will be of little use unless you are familiar with the operating system. For this reason, if you haven't "learned" OS-9 or are not comfortable with it, we suggest you read *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble.

The following is not intended as a course in OS-9. It merely states how to get the OS-9 programs from RAINBOW ON DISK to your OS-9 system disk. Use the procedures appropriate for your system. Before doing so, however, boot the OS-9 operating system according to the documentation from Radio Shack.

1) Type `load dir list copy` and press ENTER.
2) If you have only one disk drive, remove the OS-9 system disk from Drive 0 and replace it with the OS-9 side of RAINBOW ON DISK. Then type `chd/d0` and press ENTER. If you have two disk drives, leave the sytem master in Drive 0 and put the RAINBOW ON DISK in Drive 1. Then type `chd/d1` and press ENTER.
3) List the `read.me.first` file to the screen by typing `list read.me.first` and pressing ENTER.
4) Entering `dir` will give you a directory of the OS-9 side of RAINBOW ON DISK. To see what programs are in the `CMDS` directory, enter `dir cmds`. Follow a similar method to see what source files are in the `SOURCE` directory.
5) When you find a program you want to use, copy it to the `CMDS` directory on your system disk with one of the following commands:

One-drive system: `copy /d0/cmds/`*filename* `/d0/cmds/`*filename* `-s`

The system will prompt you to alternately place the source disk (RAINBOW ON DISK) or the destination disk (system disk) in Drive 0.

Two-drive system: `copy /d1/cmds/`*filename* `/d0/cmds/`*filename*

Once you have copied the program, you execute it from your system master by placing that disk in Drive 0 and entering the name of the file.

The Rainbow Seal

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There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

Rainbow Check Plus

The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and save it for later use, then type in the command `RUN` and press ENTER. Once the program has run, type `NEW` and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

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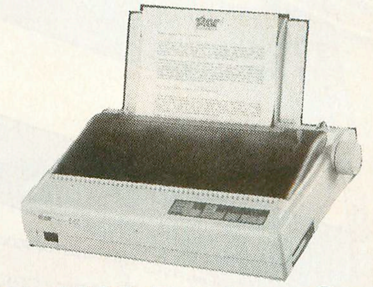

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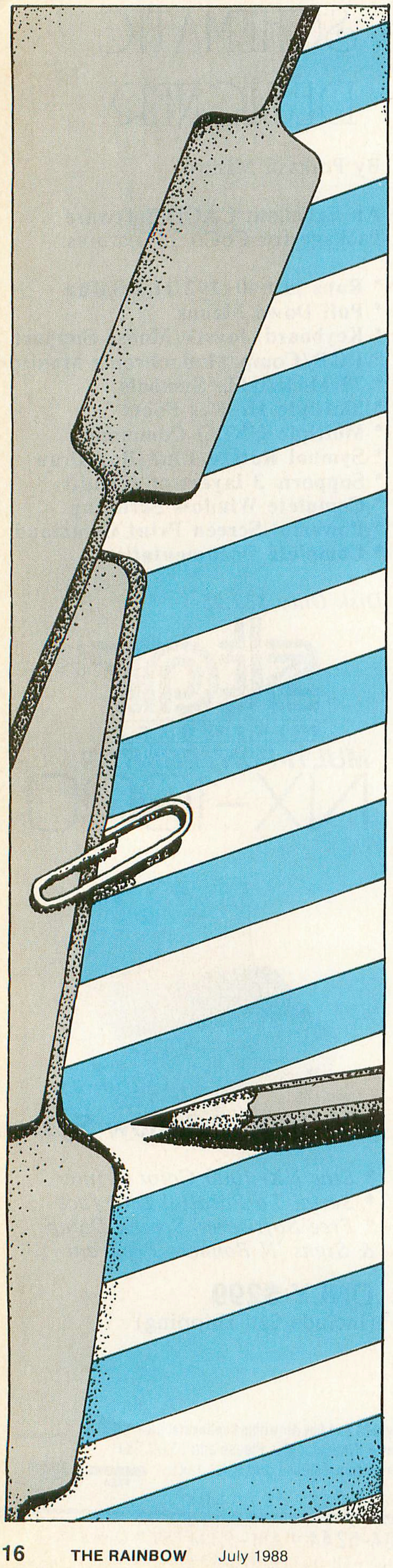

Using subdirectories and shell scripts to build an OS-9 menu system

A New Outlook for OS-9

By Mark Roseman

Microware's OS-9, like the Unix operating system on which it is based, is a very powerful and advanced system. It shares one other similarity with Unix — it can be extremely difficult to use.

While OS-9's commands are somewhat more readable than Unix's — `Dir` rather than `Ls`, or `List` rather than `Cat` — they are still cryptic enough to intimidate most users at first. And what was your own first reaction at seeing that OS9: prompt alone on the screen the first time you booted up?

This article presents a remarkably simple but effective solution to the problems of OS-9's user-unfriendliness by using user-configurable menus that give a clear indication of options available to the user, yet at the same time do not restrict the so-called "power user." The examples used here presuppose the use of a hard disk, as the system is most effective with a hard disk. However, the identical concepts and techniques can be used on systems having only floppy disks.

Shell Programs

There are several programs on the market that are designed to make OS-9 easier to use. These work by creating a shell that replaces the OS-9 command line, allowing you to copy files, execute programs, etc., without using OS-9 directly. *The OS-9 Solution* by Computerware is an excellent example of such a "shell program."

The advantages of programs like this are fairly obvious. You can manipulate your files efficiently, and there is no worry about typing an incorrect command line or filename. Having a list of files available in your current directory makes life easier by allowing you to refer to files by a number or letter in the list, rather than by a (sometimes quite long!) filename.

However, these shell programs have their downside, too. Because they essentially hide the OS-9 command line from the user, they limit your options by being less flexible. These programs

---

Mark Roseman is currently studying computer science at the University of Manitoba and has been involved with computers for many years. He is a co-owner of and programmer for TRI-C Computing.

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Max-10™

COLORWARE

BLINDING SPEED
Max-10 is entirely written in machine language. Its speed will amaze you.

SLEEK
A lot of word processors "do the job", but Max-10 makes word processing fun.

INTUITIVE
Max-10 is so well designed you can use it without reading the manual.

FUN
Max-10 is actually fun to use, which is quite an achievement for a word processor.

FORMAT
Unlimited choice of right or left alignment, centering, and line spacing. Screen is updated immediately to show exact effects of changes.

PAGE NUMBERING
On-screen page number helps you find your place.

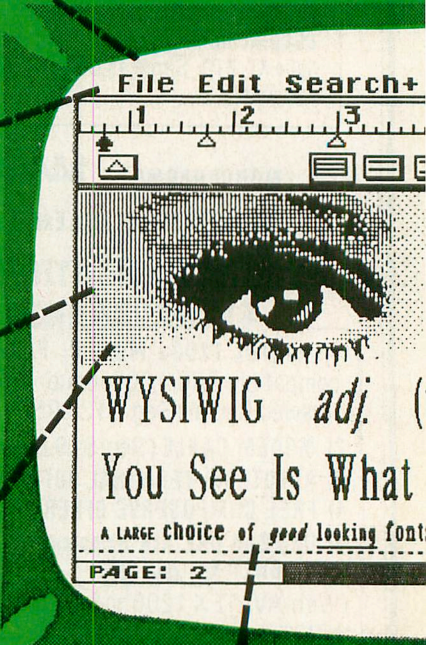
SUPERB FILE SUPPORT
Max-10 menus let you load files without typing anything: simply point and click.

FILE COMPATIBILITY
Max-10 can import files from your outmoded word processor.

GRAPHICS
Mix text and graphics on your page. Pictures can be created by CoCo Max, the DS-69 Digitizer, or any graphics editor.

FIT IT IN
Pictures can be shrunk and stretched in both directions to fit the page and text.

TAB STOPS & MARGINS
The rulers make tabs and margins easy to see, use, and change.



WYSIWIG *adj.* (

You See Is What

A LARGE choice of good looking font

CUT AND PASTE
Move anything (even graphics) anywhere in the document.

Max-10 Specifications: variable line length; right, left, top and bottom margins; word wrap; undo; page numbering; set starting page; left and right justification; centering; margins and centering can be changed anywhere in the document; variable line spacing; programmable headers and footers (with centering, graphics, etc.); type ahead; key repeat; key click; scroll up and down; jump to any point in document; ASCII file ouput for compatibility; disk directory; kill files; bold, italic, underline, superscript and subscript type styles; wordwrap; block cut, copy, move; global search and replace; paragraph indent; clipboard; merge; show file (on disk); free memory display, page count, paragraph count, word count; graphics can be resized and moved; multiple fonts; error recovery and more!

PRINTERS
Max-10 currently works with the following printers: DMP-105, DMP-106, DMP-130, Epson MX,RX,FX,LX and compatible, Gemini 10 series, CGP-220, and OKI-92.

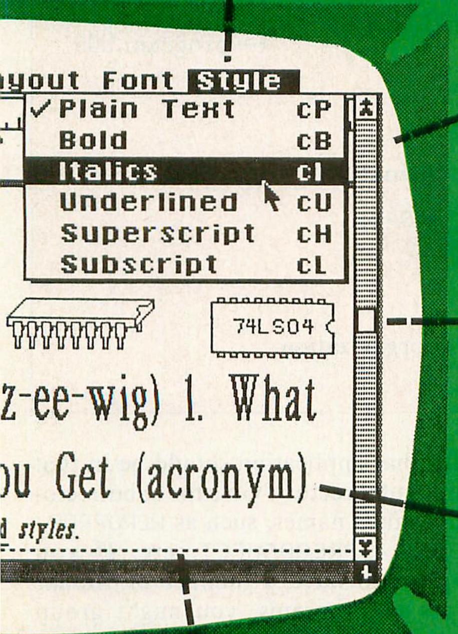
BY DAVE STAMPE
Author of CoCo Max III, the best and most acclaimed CoCo 3 Graphics Editor.

GRAPHICS
Max-10 can import pictures stored in the following formats: CoCo Max I,II,III, MGE, MGF, 5 level DS-69, as well as any standard PMODE 4, HSCREEN 2 or 3 picture.

THE DAZZLING WORD PROCESSOR
AND DOCUMENT CREATOR FOR THE COCO 3

PULL DOWN MENUS
All Max-10 Functions can be easily accessed through the six pull-down menus. There are no commands to learn.

WYSIWYG!
What You See Is What You Get. Max-10 is the only CoCo word processor with graphics where the printout looks exactly like the screen (Macintosh style).



UNDO
The undo feature lets you change your mind even AFTER you make a drastic change, such as a "block delete".

SCROLL BOX
Point and click for lightning fast access to any point in the entire document.

MORE FONTS
Max-10 features 20 different fonts (styles and sizes). It goes well beyond your printer's built in character sets.

PAGE BREAK
Dotted lines on the screen show where pages begin and end. No more surprises at printing time.

TOTAL CONTROL
Any number of available character styles and sizes can be mixed on the same line.

FULL JUSTIFICATION
Proportionally spaced characters let you create text that looks really nice. No more squished "M"s and oversized "I"s.

HEADERS & FOOTERS
These are super easy to add and edit. They can even include graphics and pictures!

Why Max-10?

Most of you already have an "adequate" word processor, so why did we spend considerable time and effort to create **Max-10**?

Because you asked for it. **CoCo Max** made graphic creation fun. It is fast and feature loaded, yet amazingly easy to use. You wanted your word processor to be as friendly, forgiving, and amazing as **CoCo Max**. We couldn't do it on the CoCo 1 or 2, but with the advanced CoCo 3 graphics, the word processor you always wanted is here: **Max-10**

Max-10 is not just a word processor. It gives you letter styles and sizes that your printer doesn't have. It lets you mix graphics and pictures in your text for a professional looking output.

Additionally, the screen shows exactly what your output will look like. Text is in the size and style that it will print. Page breaks, line length and spacing are clearly shown. No more hoping that the text will fit, no more guessing at type styles, no more messing with printer codes, no more cryptic commands to memorize, and best of all, the undo feature lets you make a mistake and still recover your text.

Max-10 makes typing easy, and you'll love the new things you can do with the best word processor ever created for the CoCo.

PRICE: $79.95

CoCo Max III OWNERS
If you already own CoCo Max III, deduct $10 from your order.

SYSTEM REQUIREMENTS
Any CoCo 3 (128K or 512K) with at least 1 Disk Drive.
Mouse or joystick.
Monochrome, RGB or Composite monitor.

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A division of Sigma Industries, Inc.

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usually contain an option to escape to the OS-9 command line, but again, this only hampers the user.

One other note about these programs: While they do allow you to execute a program by "pointing" to it, they don't actually tell you anything about the program other than the filename. Wouldn't it be nice, especially for new users, if they could tell at a glance what a program actually did?

The menu system described in this article has the advantages of being extremely efficient, user-friendly and easy to implement, yet does not give up any of the power of having the command line available at all times. When the system first boots up, a menu that looks like Figure 1 appears on the screen. A list of the available applications is spelled out for the user, and a short abbreviation is given. Typing the abbreviation will execute the given program, or perhaps display a comparable menu, showing other options (Figure 2). At the same time all these descriptive menus are being displayed, you can type any OS-9 command you'd like.

```
********************************
*         Welcome to           *
*     <<< THE MACHINE >>>      *
*                              *
*         MAIN MENU            *
*                              *
*  WP ..  Scribble WordPro     *
*  SS ..  FabCalc Spreadsheet  *
*  PT ..  Phone Terminal       *
*  PM ..  Programming Menu     *
*  DU ..  Disk Utilities       *
*   Enter option or OS9 cmnd   *
********************************
```

Figure 1: The main `Menu.dat` **file**

```
********************************
*    <<< THE MACHINE >>>       *
*                              *
*      PROGRAMMING MENU        *
*                              *
*  CC  ..  C Compiler          *
*  BAS ..  Basic09             *
*  PAS ..  Pascal              *
*  MM  ..  Back  to Main Menu  *
*    Enter option or OS9 cmnd  *
********************************
```

Figure 2: The `Menu.dat` **file for the** `PROGRAMMING` **subdirectory**

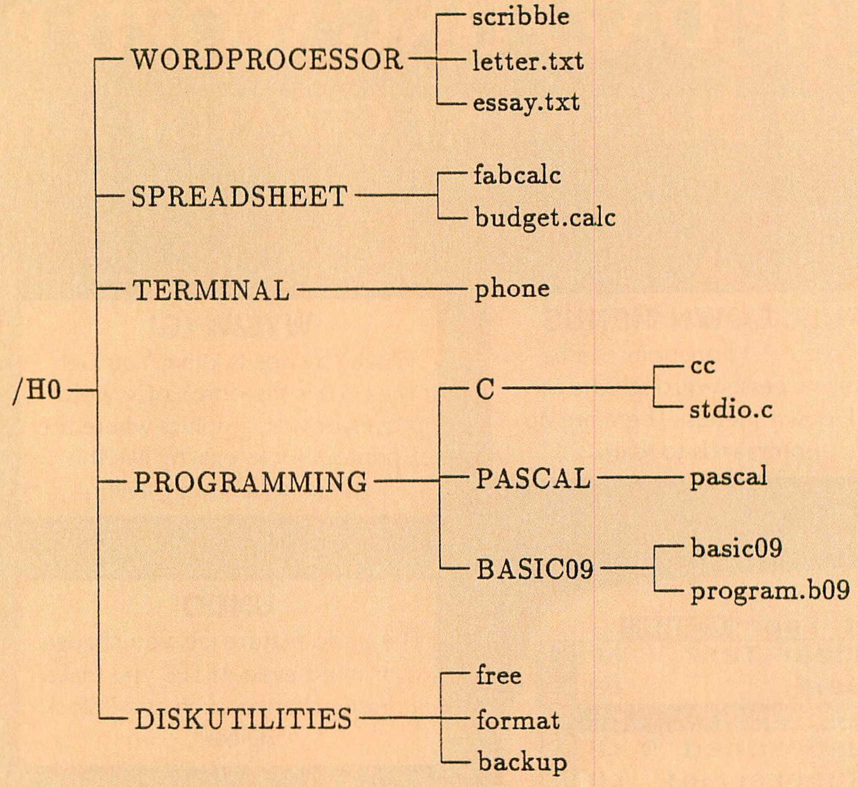


Figure 3: A typical disk organization

How it Works

This system is not terribly complicated or difficult to understand, but it does require a solid understanding of two fundamental concepts in OS-9: the hierarchal directory structure and OS-9 shell scripts. The hierarchal directory structure — in other words, the use of subdirectories — is a subject that is explained fairly well in the OS-9 manuals. There have also been several articles in previous RAINBOWs that have done an excellent job of explaining this concept. Shell scripts are also explained in the manuals. Briefly, they are text files containing a series of OS-9 commands. When one of these scripts is executed (by typing its filename), the commands in the file are executed by OS-9 just as if you had typed them in one at a time by hand. These shell scripts can be created using `Build`, `Edit` or any other text editor.

The menuing system first requires your disk drive be set up in an organized and logical manner (see Figure 3 as an example). Each application program you have should be placed in its own subdirectory, and all the files associated with that application should be in that same subdirectory. Give the subdirectories logical names, such as `WORDPROCESSOR`, `SPREADSHEET`, etc. If you happen to have a number of similar types of programs, you might group them together. For example, you might have a subdirectory `PROGRAMMING`, and inside that subdirectory have other subdirectories called `C`, `PASCAL` and `BASIC09`.

You'll have to create two things in your main directory, as well as in any subdirectories contianing *other* subdirectories (such as the `PROGRAMMING` subdirectory mentioned above). These two things are a help menu and a set of script files.

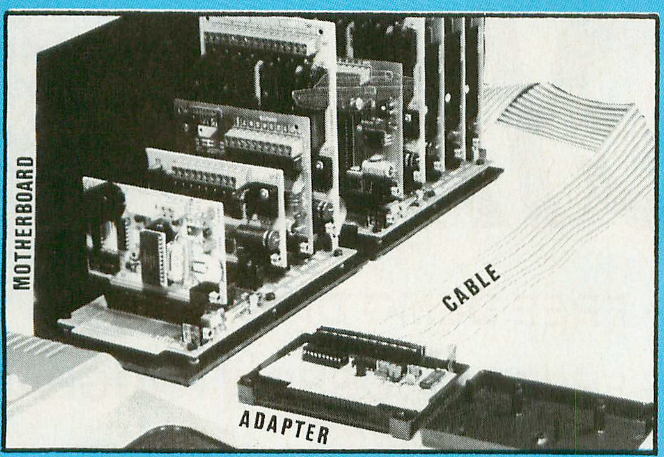
What About Those Menus?

You've seen examples of these menus already. Figure 1 is an example of a typical menu found in the root (startup) directory, while Figure 2 illustrates a possible menu found in our `PROGRAMMING` subdirectory.

There is nothing very special about the format of these menus. They are just regular text files and can contain any-

The Amazing A-BUS

NEW



An A-BUS system with two Motherboards
A-BUS adapter in foreground

The A-BUS system works with the original CoCo, the CoCo 2 and the CoCo 3.

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With the A-BUS you can plug your PC (IBM, Apple, TRS-80) into a future of exciting new applications in the fields of control, monitoring, automation, sensing, robotics, etc.

Alpha's modular A-BUS offers a proven method to build your "custom" system today. Tomorrow, when *you are ready* to take another step, you will be able to add more functions. This is ideal for first time experimenting and teaching.

A-BUS control can be entirely done in simple BASIC or Pascal, and no knowledge of electronics is required!

An A-BUS system consists of the A-BUS adapter plugged into your computer and a cable to connect the Adapter to 1 or 2 A-BUS cards. The same cable will also fit an A-BUS Motherboard for expansion up to 25 cards in any combination.

The A-BUS is backed by Alpha's continuing support (our 11th year, 50000 customers in over 60 countries).

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About the A-BUS system:

- All the A-BUS cards are very easy to use with any language that can read or write to a Port or Memory. In BASIC, use INP and OUT (or PEEK and POKE with Apples and Tandy Color Computers)
- They are all compatible with each other. You can mix and match up to 25 cards to fit your application. Card addresses are easily set with jumpers.
- A-BUS cards are shipped with power supplies (except PD-123) and detailed manuals (including schematics and programming examples).

Relay Card RE-140: $129

Includes eight industrial relays, (3 amp contacts, SPST) individually controlled and latched. 8 LED's show status. Easy to use (OUT or POKE in BASIC). Card address is jumper selectable.

Reed Relay Card RE-156: $99

Same features as above, but uses 8 Reed Relays to switch low level signals (20mA max). Use as a channel selector, solid state relay driver, etc.

Analog Input Card AD-142: $129

Eight analog inputs. 0 to +5V range can be expanded to 100V by adding a resistor. 8 bit resolution (20mV). Conversion time 120us. Perfect to measure voltage, temperature, light levels, pressure, etc. Very easy to use.

12 Bit A/D Converter AN-146: $139

This analog to digital converter is accurate to .025%. Input range is −4V to +4V. Resolution: 1 millivolt. The on board amplifier boosts signals up to 50 times to read microvolts. Conversion time is 130ms. Ideal for thermocouple, strain gauge, etc. 1 channel. (Expand to 8 channels using the RE-156 card).

Digital Input Card IN-141: $59

The eight inputs are optically isolated, so it's safe and easy to connect any "on/off" devices, such as switches, thermostats, alarm loops, etc. to your computer. To read the eight inputs, simply use BASIC INP (or PEEK).

24 Line TTL I/O DG-148: $65

Connect 24 input or output signals (switches or any TTL device) to your computer. The card can be set for: input, latched output, strobed output, strobed input, and/or bidirectional strobed I/O. Uses the 8255A chip.

Clock with Alarm CL-144: $89

Powerful clock/calendar with: battery backup for Time, Date and Alarm setting (time and date); built in alarm relay, led and buzzer; timing to 1/100 second. Easy to use decimal format. Lithium battery included.

Touch Tone® Decoder PH-145: $79

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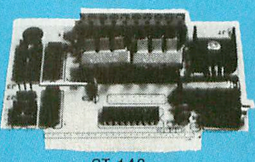
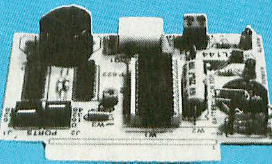
A-BUS Prototyping Card PR-152: $15

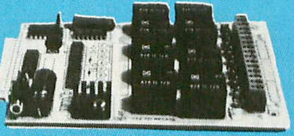
3½ by 4½ in. with power and ground bus. Fits up to 10 I.C.s



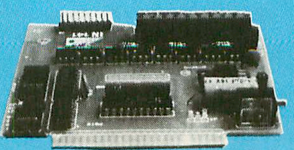
ST-143



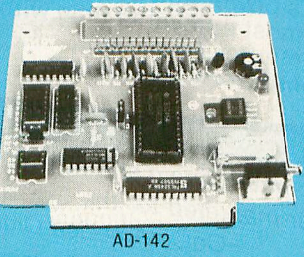
CL-144



RE-140



IN-141



AD-142

Smart Stepper Controller SC-149: $299

World's finest stepper controller. On board microprocessor controls 4 motors simultaneously. Incredibly, it accepts plain English commands like "Move arm 10.2 inches left". Many complex sequences can be defined as "macros" and stored in the on board memory. For each axis, you can control: coordinate (relative or absolute), ramping, speed, step type (half, full, wave), scale factor, units, holding power, etc. Many inputs: 8 limit & "wait until" switches, panic button, etc. On the fly reporting of position, speed, etc. On board drivers (350mA) for small steppers (MO-103). Send for SC-149 flyer.

Remote Control Keypad Option RC-121: $49
To control the 4 motors directly, and "teach" sequences of motions.

Power Driver Board Option PD-123: $89
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Stepper motors are the ultimate in motion control. The special package (below) includes everything you need to get familiar with them. Each card drives two stepper motors (12V, bidirectional, 4 phase, 350mA per phase).

Special Package: 2 motors (MO-103) + ST-143: **PA-181: $99**

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TRS-80 Model 102, 200 Plugs into 40 pin "system bus".	AR-136...$69
Model 100. Uses 40 pin socket. (Socket is duplicated on adapter).	AR-135...$69
TRS-80 Mod 3,4,4D. Fits 50 pin bus. (With hard disk, use Y-cable).	AR-132...$49
TRS-80 Model 4P. Includes extra cable. (50 pin bus is recessed).	AR-137...$62
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In Everyone's book, CoCo Max is rated again and again as the most incredible product ever marketed for the CoCo.
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Note: *There is* only one *CoCo Max III*. Do not confuse COLORWARE's *CoCo Max* with similar sounding imitations.

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More Resolution   More Power   More Color   Built-in Animation   More Speed   More Type Styles   More Tools   Amazing Color Sequencing

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That's how thousands of enthusiastic users rated the **CoCo Max II** drawing program. With **CoCo Max III** we are ready to amaze them again. Instead of "patching" CoCo Max II, we rewrote it from scratch to take advantage of the CoCo Max III hardware. The results will knock your socks off! Below is a brief list of some of the *new* features, but some, such as **animation**, **color sequencing**, or the **slide show**, have to be seen. Send for the Demo Disk, and see for yourself.

Everybody's favorite drawing package features:
- A 50% larger editing window. - Zoom area **400%** larger. - New drawing tools: **rays, 3D cubes, arcs**,... - New editing tools: shadow, text size,... - Rotate by 1.5° steps - Select any 16 of the 64 possible colors (all 64 colors displayed at once!) - Powerful **color mix**: additive, subtractive, overlay,... - Full **color editing** of patterns and color changing patterns. - Incredible **special effects** with **color cycling** up to 8 colors with variable speed. -**Animation** adds the dimension of motion to your image. (Must be seen.) - Sophisticated data compression saves up to 70% of disk space when saving pictures.
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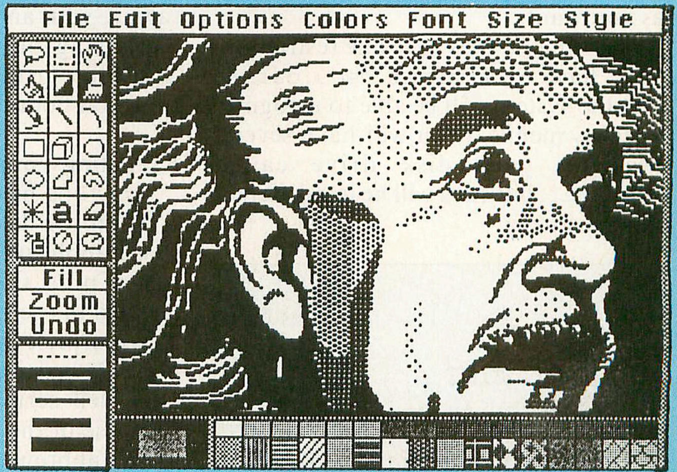

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More about CoCo Max III

- CoCo Max III is not an upgrade of CoCo Max II. It is entirely rewritten to take advantage of the new CoCo 3 hardware (More memory, resolution, colors, speed,...)
- The new CoCo Max III **Hi-Res Interface** and the CoCo Max II **Hi-Res Pack** are *not* interchangable.
- The new interface plugs into the joystick connector.
- The CoCo Max III disk is not copy protected.
- CoCo Max III only works with the CoCo 3.
- A Y-Cable or Multi-pak is not necessary.
- Colors are printed in five shades of gray.
- CoCo Max III can read CoCo Max II pictures.

Note: CoCo Max II (for the CoCo 2) is still available on disk ($79.95). CoCo Max I is still available on tape ($69.95). For details, refer to our double page ad in any *Rainbow* from January '86 to July '87

Toll Free operators are for orders only. If you need precise answers, call the **tech line**. (Detailled CoCo Max specs are included with the Demo Disk.)

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* Beware of inferior imitations that *DO NOT* include a Hi-Res Interface or charge extra for each utility.

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thing you'd like. You can create them using `Build`, `Edit` or any other editor. What they *should* contain, however, is a list of the different applications (word processor, etc.) available and the abbreviations used to access them. These abbreviations can be anything you'd like; however, they should not be the names of other OS-9 commands, except under special circumstances where you actually want that command executed (as would be the case in a `DISKUTILITIES` subdirectory containing the `Free` or `Format` commands). Aside from that, put anything you like in the menu files — borders, titles, or anything else. You can personalize these as much as you want.

These menu files have one restriction: They have to be named `Menu.dat`, so that the system will be able to recognize them as menus. (You will have several files on your disk drive called `Menu.dat`, but each will be in a different subdirectory.)

> ***"You can manipulate your files efficiently, and there is no worry about typing an incorrect command line or filename."***

Creating Your Own Commands

What we now want to do is use shell scripts to create some new commands of our own. The first one will be a command to print the menu for whatever subdirectory in which you happen to be located at the moment. Because we want this command (which will logically enough be called `Menu`) to work no matter what subdirectory we are in, we'll create it in the standard "current execution directory," `/H0/CMDS` if you are using a hard disk, or `/C0/CMDS` for a floppy system. (If you're not sure why the file must be in this special directory, refer to the OS-9 manuals.)

The `Menu` command is fairly short, containing only two commands, `Cls` and `List Menu.dat`. To create this file using `Build`, type `build /h0/cmds/menu`, followed by the two commands above, and then enter a blank line to end. Now, whenever you type `menu`, you'll get a list of the menu file in the directory you're currently in. If you happen to do this in a subdirectory without a `Menu.dat` file, you'll get an error telling you that the file was not found. However, as you'll see, you won't normally encounter this.

Remember that we wanted such a menu displayed when the system was first booted up? This can be easily done at this point. In the root directory there is a special shell script named `Startup` that is executed when you first boot OS-9. It normally will do things like set the system clock, but you can add (again, with an editor) at the end a line containing only the command `Menu`. You'll then get the menu displayed each time you boot up.

Executing Your Applications

Only one piece of this whole system is left to be discussed: How do we get those application programs started by just typing the abbreviations we've decided to use for them? It should come as no surprise that more shell scripts are used. In particular, we have to create one shell script per application. The filename of the script must be the same as the abbreviation used in the menu, and the script must be in the same directory as the `Menu.dat` file describing it.

What should these shell scripts do? Well, exactly what you would do yourself to execute the application! First, you'd have to change directories so that you are in the same directory as the application. You'd then execute the program by typing its filename. When it was done, you'd change back to your previous directory, and then redisplay the menu.

Figure 4 is an example of such a script, used to call a word processing program called *Scribble*, which is in the subdirectory `WORDPROCESSOR`. The script would be called `Wp`, in accordance with the menu in Figure 1. Note the use of `Chd ..` to return to the previous directory.

Recall the earlier example of the `PROGRAMMING` subdirectory. In this case, we want the shell script on the main menu to merely go to the new directory and display that menu. This is accomplished with a script containing the two lines `Chd Programming` and `Menu`. You also want an option on the `PROGRAMMING` menu that returns to the main menu. This script contains the two lines `Chd ..` and `Menu`.

```
* Here is an example shell
* script which will execute
* a program called 'scribble'
* in the 'wordprocessing'
* directory.
*
* Note that the lines which
* start with a '*' are just
* comments which can be left
* out.
*
* If a program requires any
* parameters, they should be
* included in the second line
* below.  For instance, you
* might need to change the
* line to 'scribble -c' if
* the program required this.
*
chd wordprocessing
scribble
chd ..
menu
```

Figure 4: The `Wp` shell script

You've now seen the complete system. No "sneaky tricks" were used — everything was implemented using the standard ideas of subdirectories and shell scripts. Again, note that even with all the menus and abbreviations available, you were still always using the OS-9 command line.

When you install new programs on your system, you will need to do two things — add to one of your `Menu.dat` files a line describing the new program, and create a new script file to call your program.

It should be apparent why a hard disk would be more appropriate than floppy disks for a system such as this one. Generally, all the applications would reside on a single disk. A hard disk, having much more space, would be able to hold many more applications.

This system can actually be implemented on any machine using an operating system that supports subdirectories and shell scripts (often called "batch files"). Wouldn't you love to tell your boss that the menuing system you've installed on the company's IBM PS/2 Model 80 is an adaptation of something on your "wimpy CoCo" he keeps laughing at?

(Questions and comments concerning this tutorial may be directed to the author at 736 Queenston St., Winnipeg, Man., Canada R3N 0X7. Please enclose an SASE when requesting a reply.)

VIP Writer III

VIP Writer has ALWAYS led the pack with features and now VIP Writer III still leads the way! The chart below illustrates this fact. Telewriter 128 only gives you 48K for text. Why is it called Telewriter 128? Word power 3 gives only 72K! VIP Writer III makes use of over 106K! VIP Writer III is the ONLY CoCo 3 word processor worthy of it's name!

WORD PROCESSOR COMPARISON CHART			
CoCo3 with 128K	**VIP Writer III**	Telewriter 128	Word Power 3
Text Storage	OVER 49,000	48,000	72,000
Print Spooler	YES 57,000	NONE	NONE
Total Storage	**106,000**	48,000	72,000
Spelling Checker	VIP Speller	NONE	FREE WARE
RGB HD Support	100%	NONE	NONE
Screen Display	32/40/64/80	40/80	80

SCREEN DISPLAY OPTIONS

As the chart above shows - VIP Writer III offers more screen width options -all with 24 lines and actual lower case letters. It uses the CoCo 3's hardware display and double clock speed and is VERY VERY FAST! You can choose fore and background colors from up to 64 different hues. Color can be turned ON or OFF for the best possible display using a color or monochrome monitor or TV set. VIP Writer III has a built in on-line context sensitive help facility which displays command usage in easy to read colored windows.

CUSTOMIZER & PRINTER INSTALLER

VIP Writer III comes with a configuration / printer installation program which lets you customize VIP Writer III to suit your own liking. You can set screen width and colors as well as margins and more. You can also install your own printer and set interface type (serial, parallel or J&M), baud rate, line feeds, etc. Once done, you never have to enter these parameters again! VIP Writer III will load n' go with your custom configuration every time!

TEXT FILE STORAGE

VIP Writer III creates ASCII text files which are compatible with all other VIP Programs as well as other programs which use ASCII file format. You can use VIP Writer III to even create BASIC programs! There is a 49K text buffer and disk or cassette file linking allowing virtually unlimited text space. VIP Writer III works with up to four disk drives and lets you display disk directories and free space as well as rename or kill disk files. In addition VIP Writer III is 100% compatible with the RGB Computer Systems HARD DISK.

EDITING FEATURES

VIP Writer III has a full featured screen editor which can be used to edit text with lines up to 240 characters long with or without automatic word wrap around. You can select type-over mode or insert mode. There is even an OOPS command to recall a cleared text buffer. Other editing features include: Type-ahead • typamatic key repeat and key beep for flawless text entry • end of line bell • full four way cursor control with scrolling • top of textfile • bottom of textfile • page up • page down • top of screen • bottom of screen • beginning of line • end of line • left one word • right one word • DELETE character, to beginning or end of line, word to the left or right, or entire line • INSERT character or line • LOCATE and/or CHANGE or DELETE single or multiple occurrence using wildcards • BLOCK copy, move or delete with up to TEN simultaneous block manipulations • TAB key and programmable tab stops • word count • line restore • three PROGRAMMABLE FUNCTIONS to perform tasks such as auto column creation and multiple copy printing.

TEXT FORMATTING

VIP Writer III automatically formats your text for you or allows you to format your text in any way you wish. You can change the top, bottom, left or right margin and page length. You can set your text flush left, center or flush right. You can turn right hand justification on or off. You can have headers, footers, page numbers and TWO auxiliary lines which can appear on odd, even or all pages. You can also select the line on which they appear! You can even change the line spacing! Parameters can be altered ANYWHERE!

PREVIEW PRINT WINDOW

VIP Writer III features an exclusive format window which allows you to preview your document BEFORE PRINTING IT! You are able to move up, down, left and right to see centered text, margins, page breaks, orphan lines etc. This makes hyphenation a snap!

PRINTING

VIP Writer III prints TWICE as fast as any other CoCo word processor! It supports most serial or parallel printers using J&M JFD-CP or Rainbow interface and gives you the ability to select baud rates from 110 to 19,200. You can imbed printer control codes anywhere in your text file EVEN WITHIN JUSTIFIED TEXT! VIP Writer III also has TWENTY programmable printer macros which allow you to easily control all of your printers capabilities such as bold, underline, italics and superscript using simple key strokes. Other features include: multiple copy printing • single sheet pause • line feeds.

PRINT SPOOLING

Save up to $150 on a *print spooler* because VIP Writer III has a built in print spooler with a 57,000 character buffer which allows you to print one document WHILE you are editing another. You don't have to wait until your printer is done before starting another job!

DOCUMENTATION

VIP Writer III is supplied with a 125 page instruction manual which is well written and includes many examples. The manual has a tutorial and glossary of terms for the beginner as well as a complete index! VIP Writer III includes VIP Speller. DISK $79.95
Cassette version does not include VIP Speller. TAPE $59.95

VIP Writer owners: Upgrade to the VIP Writer III Disk for $49.95 or Tape for $39.95. Send original disk or tape. Include $3 S/H.

It's Word Processor Trade In Time

For a limited time you can trade in your old software for the VIP Writer I or III and save up to $20! Send in your old disk or tape and manual. VIP Writer tape $34.95, disk $49.95. VIP Writer III tape $44.95, disk $59.95. Include $3.00 shipping. Offer expires 8/31/88

VIP Database III

The VIP Database III features selectable screen displays of 40, 64 or 80 characters by 24 lines with choice of 64 foreground and background colors for maximum utility. It uses the CoCo 3's hardware screen and double clock speed to be the FASTEST database available! VIP Database III will handle as many records as will fit on your disks and is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses,etc., in ascending or descending alphabetical or numeric order. Records can be searched for specific entries using multiple search criteria. With Database III mail-merge you may also combine files, sort and print mailing lists, print form letters, address envelopes - the list is endless. The built-in MATH package even performs arithmetic operations and updates other fields. VIP Database III also has a print spooler and report generator with unlimited print format capabilities including embeddable control codes for use with ALL printers. DISK $69.95

VIP Database owners: Upgrade to the VIP Database III Disk for $39.95. Send original disk. Include $3 shipping.

VIP Integrated Library

The VIP Integrated Library combines all six popular VIP application programs - VIP Writer*, Speller, Calc, Database*, Terminal and Disk-ZAP - into one program on one disk! The program is called VIP Desktop. From the desktop you have instant access to word processing with a spelling checker always in attendance, data management with mail merge, spreadsheet financial analysis, telecommunications and disk maintenance. 64K. required . Include $4.00 shipping for this product. DISK $149.95
*CoCo 3 owners: Purchase the VIP Integrated Library /WDE (Writer & Database Enhanced) which has the VIP Writer III and VIP Database III in place of the VIP Writer and VIP Database. Include $4.00 shipping for this product. DISK $169.95

Previous VIP Library owners: Call or write for upgrade pricing.

VIP Writer

VIP Writer is also available for CoCo 1 and 2 owners and has all the features found in the VIP Writer III including VIP Speller except for the following: The screen display is 32, 51, 64 or 85 columns by 21 or 24 rows. Screen colors are green, black or white. Help is not presented in colored windows. Double clock speed is not supported. Parallel printer interface is not supported. Print spooler is not available. Hard disk is not supported. Even so, VIP Writer still out-features the rest! It's a CoCo 1 or 2 owners best choice in word processors. Includes VIP Speller. DISK $69.95
Cassette version does not include VIP Speller. TAPE $49.95

VIP Speller

VIP Speller works with ANY ASCII file created by most popular word processors. It automatically checks text files for words to be corrected, marked for special attention or even added to the dictionary. You can even view the misspelled word in context! VIP Speller comes with a specially edited 50,000 word dictionary, and words can be added to or deleted from the dictionary or you can create your own. DISK $34.95

VIP Database

VIP Database has all the features of VIP Database III except the screen widths are 51, 64 and 85. Screen colors are green, black and white, double speed is not supported, spooler is not available. Still VIP Database is the best database for the CoCo 1 & 2! DISK $49.95

VIP Calc

Now every CoCo owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some. VIP Calc displays 32, 51, 64 or 85 characters by 21 or 24 lines right on the screen. VIP Calc allows up to a 33K worksheet with up to 512 columns by 1024 rows! In addition, VIP Calc has multiple windows which allow you to compare and contrast results of changes. Other features include 16 DIGIT PRECISION • trig. functions • averaging • algebraic functions • column and row ascending and descending SORTS • locate formulas or titles in cells • block move and replicate • global or local column width • limitless programmable functions • works with ANY printer. Embed printer control codes for customized printing. Combine spreadsheet data with VIP Writer documents to create ledgers, projections, statistical and financial budgets and reports. Requires 64K. DISK $59.95

VIP Terminal

For your important communications needs you've got to go beyond software that only lets you chat. You need a smart terminal so that you can send and receive programs and messages and print them! The VIP Terminal features 32, 51, 64 or 85 characters by 21 or 24 lines on the screen and has a 43K byte buffer to store information. DISK $39.95

VIP Disk-ZAP

VIP Disk-ZAP is the ultimate disk repair utility for simple and quick repair of most disk errors. Designed with the non-programmer in mind, the VIP Disk-ZAP will let you retrieve all types of bashed files, BASIC and Machine Language programs. It even works with 40 track drives! The 50 page tutorial makes the novice an expert. DISK $24.95

All disk products are unprotected and run under RSDOS.

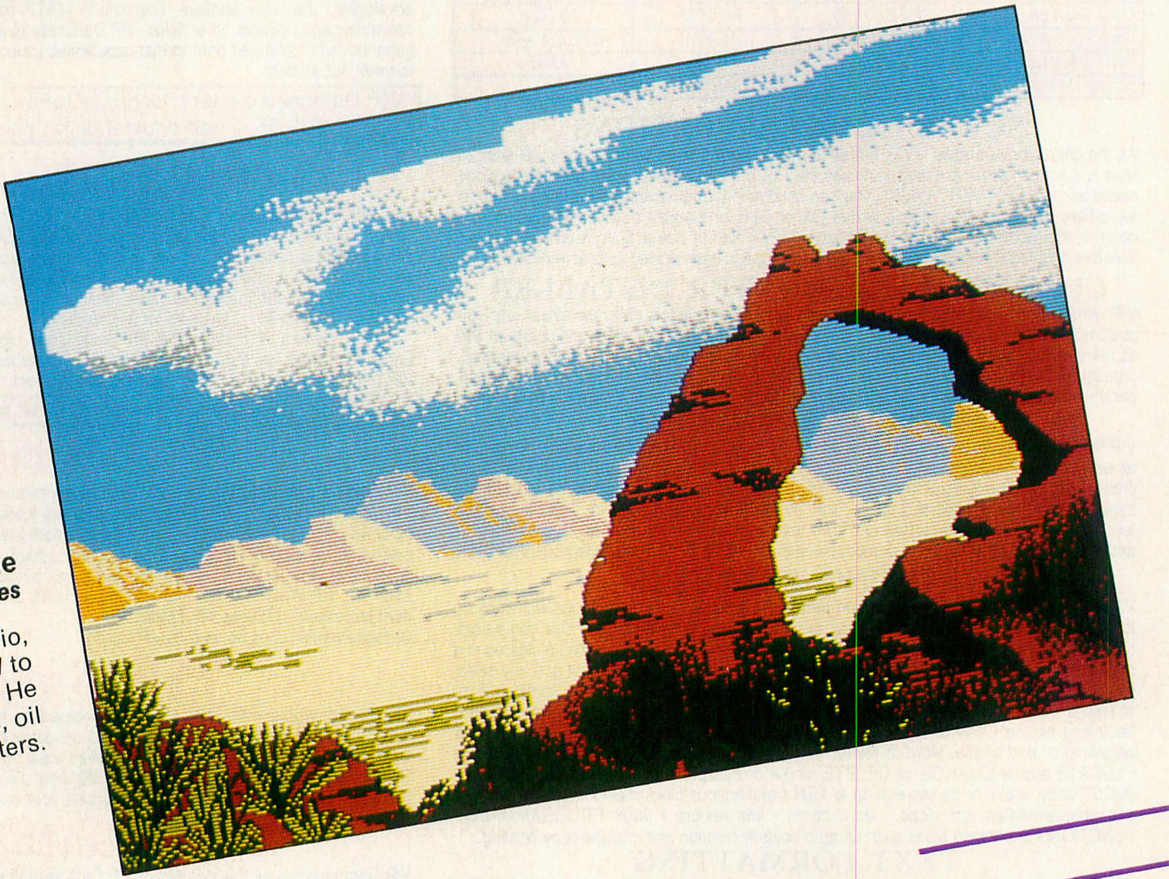
SD ENTERPRISES

☎(503) 663-2865 ✉POB 1233 Gresham, OR 97030

Please add $3 for shipping and handling. Outside continental US add $4 S/H. COD orders add an additional $2.25. Checks allow 3 weeks for delivery. All other orders are shipped the same day.

Telewriter 128 is a trademark of Cognitec. Word Power 3 is a trademark of Microcom Software.

The CoCo Gallery



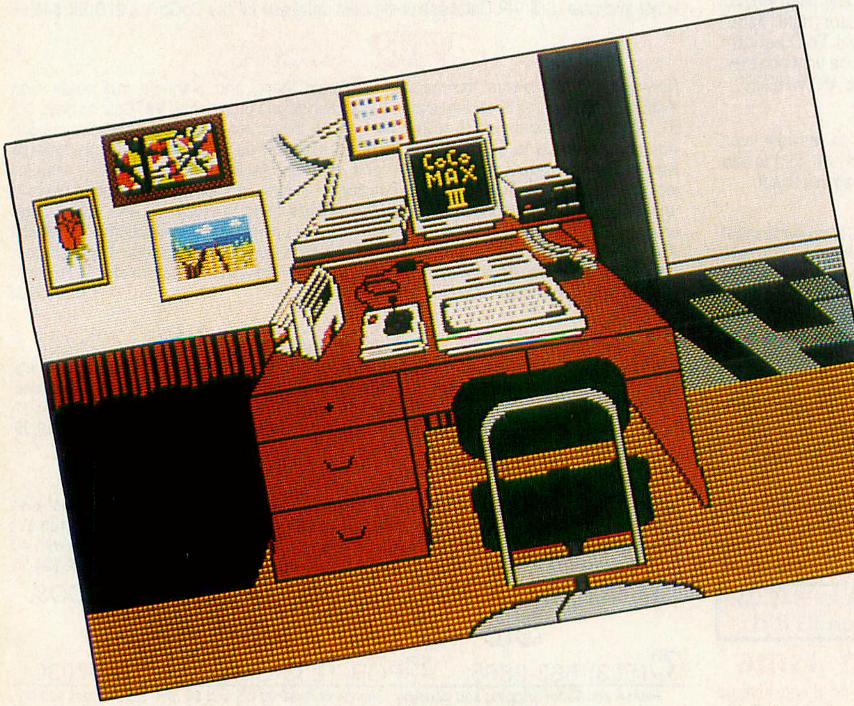
1st

COCO 3

Sandstone

Wally Mayes

Wally, of Hamilton, Ohio, used *CoCo Max III* to design this graphic. He enjoys country music, oil painting and computers.



2nd

Setup

Pete Hagemeyer

Pete used *CoCo Max III* to display his computer setup. He lives in Bethlehem, Pennsylvania, and enjoys model railroading, drawing and working with the CoCo.

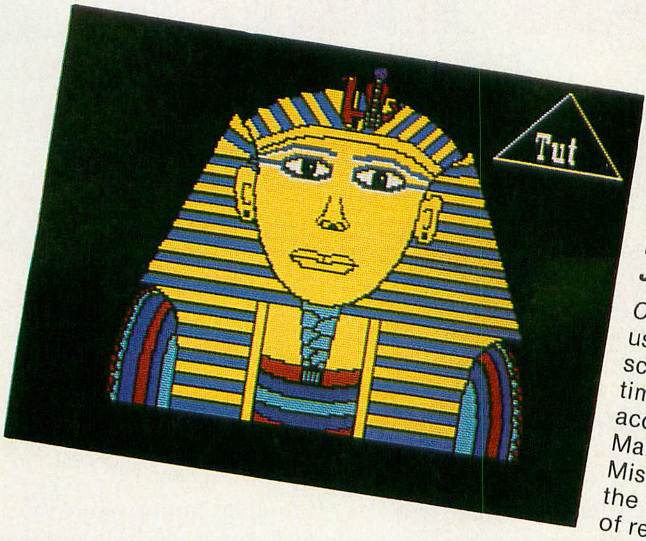
SHOWCASE YOUR BEST! You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community! Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also, please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is *not* an original work.

We will award two first prizes of $25, one for the CoCo 3 and one for the CoCo 1 and 2; one second prize of $15 and one third prize of $10. Honorable Mentions may also be given.

Please send your entry on either tape or disk to the CoCo Gallery, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. Remember, this is a contest and your entry will not be returned.

— Angela Kapfhammer, Curator

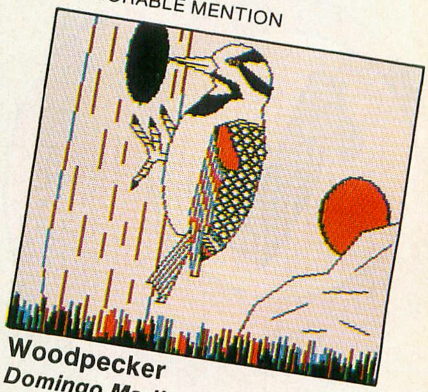


3rd

King Tut
Jerry Suchman

CoCo Max III was used to create this scene of this ancient time. Jerry is an accountant, lives in Manchester, Missouri, and uses the CoCo as a form of relaxation.

HONORABLE MENTION



Woodpecker
Domingo Martinez

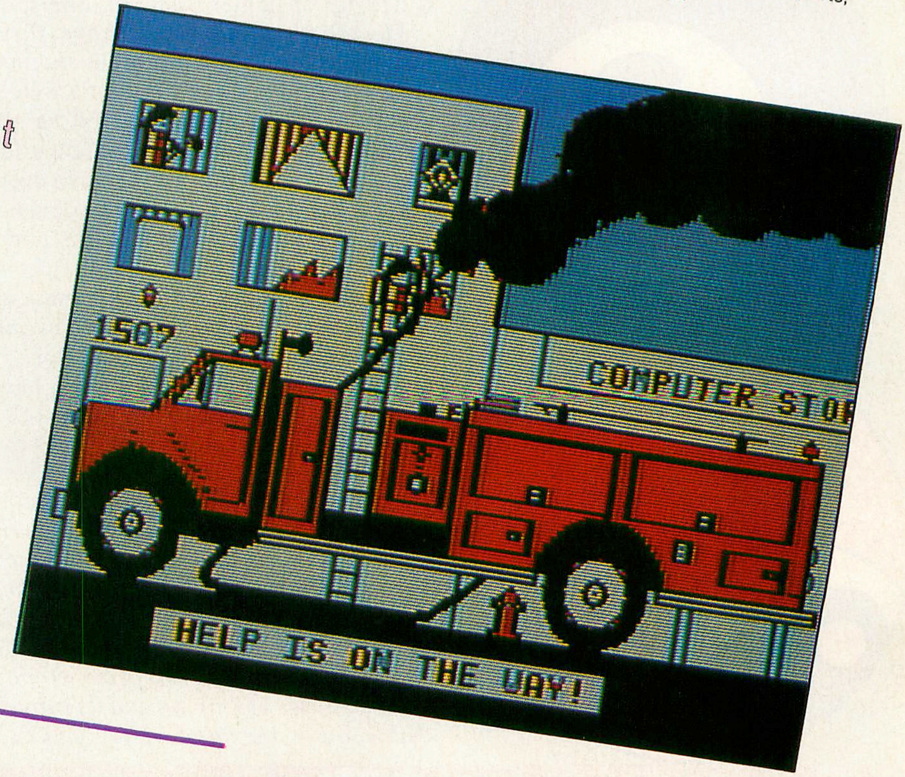
Domingo, of Miami, Florida, used BASIC and the CoCo 2 to develop this view of the tree-climbing bird. He enjoys sports, movies and his CoCo.

1st

COCO 1 & 2

Help is on the way
Carl Johnson

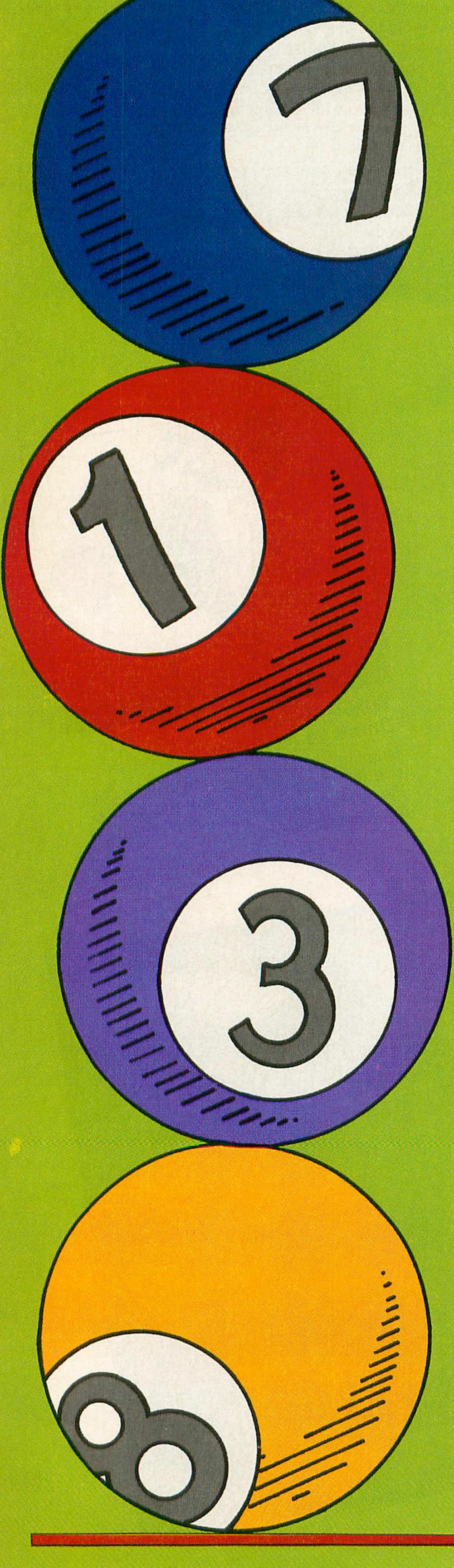
CoCoDraw was used to develop this scene of rescue. Carl is a firefighter in Sioux Falls and lives in Brandon, South Dakota.



A logic problem tester

One of Our Pool Balls Must Be Crazy!

By Bruce W. Ronald

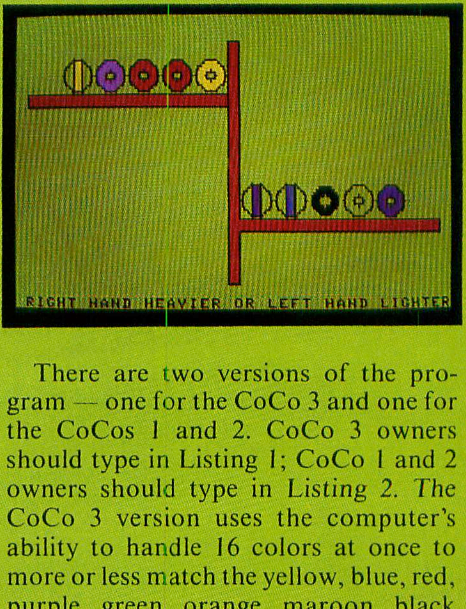


You're a pool ball salesman, and your best customer is irate. The last set of 12 balls you sold him has one defective ball. He tells you to find out which of the balls, numbered 1 through 12, is the culprit — and if it is heavier or lighter than the others.

He tells you that you have three weighings only, on a simple balance scale. Your job is to figure out a weighing technique capable of finding the rogue ball every time — the algorithm, in computer talk. It must work in every case, no matter which ball is the deviant, and it must tell if the deviant is either heavy or light.

One final point. A simple balance scale doesn't weigh anything. It can only show you if one side is heavier (or lighter) than the other. If the left-hand side drops, it is either because there's a heavy ball on the left side or a light ball on the right.

It took me hours to find the trick (and if you figure it out in 15 minutes, I don't want to know). I have prepared a program that will select a deviant ball for you, determine if it is light or heavy, and conduct any three weighings (such as 1, 2 and 3 versus 4, 5 and 6) you choose.



RIGHT HAND HEAVIER OR LEFT HAND LIGHTER

There are two versions of the program — one for the CoCo 3 and one for the CoCos 1 and 2. CoCo 3 owners should type in Listing 1; CoCo 1 and 2 owners should type in Listing 2. The CoCo 3 version uses the computer's ability to handle 16 colors at once to more or less match the yellow, blue, red, purple, green, orange, maroon, black pool ball sequence. The CoCo 1 and 2 version uses red and blue on a `PMODE3` screen.

Bruce Ronald, an advertising copywriter, holds a bachelor's degree in speech. He has written a science fiction thriller, Our Man in Space, *and the book of the musical* Dracula, Baby. *He and his wife, Virginia, coauthored two prize-winning local histories of Dayton and its suburb, Oakwood — the latter on the CoCo.*

Telewriter-128™

the Color Computer 3 Word Processor

For over 5 years now, Telewriter has been the #1 Color Computer word processor, both in popularity and in performance. Telewriter's near perfect mix of sophisticated professional features and a very natural user interface, has earned it the highest praise in numerous magazines, and an intensely loyal following among tens of thousands of Color Computer users all over the world.

HISTORY

Throughout the history of the Color Computer, Telewriter has pioneered software breakthroughs that set the standards.

In 1981, it was Telewriter 1.0 that first took the Color Computer's inadequate 32X16 all-uppercase display, and replaced it with a graphics-based 51X24 upper and lowercase display.

A few years later, Telewriter-64 added high density 64X24 and 85X24 displays and access to the full 64K of the newer Color Computers.

THE NEW AGE

Today, Telewriter-64 is recognized as the standard Color Computer word processor. It runs on all Tandy Color Computers — from the original Color Computer 1, to the Color Computer 2, and 3.

But the Color Computer 3 brings a whole new level of power to low cost computing and, so, a new Telewriter is here to put that power to work for you. We call it Telewriter-128.

TELEWRITER-128

You don't mess with a good thing, so Telewriter-128 is still Telewriter-64 at heart. The commands, and the user interface are essentially the same. If you know Telewriter-64, then you already know Telewriter-128. And, if you don't know Telewriter-64, you'll still have an easy time learning and using Telewriter-128.

80 COLUMNS

But there are major differences as well. First, Telewriter-128 uses the Color Computer 3's new 80 column screen display.

This means, simply, that using Telewriter-128 on a low cost Color Computer 3 will look a lot like using a more expensive word processor on a much more expensive IBM PC, PS/2, or clone.

SPEED

Second, Telewriter-128 is lightning fast. Telewriter-64 was fast in its own right, but, by accessing the Color Computer 3's video hardware directly, and by running the machine in double speed mode, Telewriter-128 is able to provide extremely fast scrolling and instant paging — functions whose speed is crucial to serious word processing.

In this department, Telewriter-128 doesn't simply keep up with IBM-based word processors — it generally surpasses them!

EASE

Third, Telewriter-128 adds a host of new features big and small, that make it even easier to use.

Features like: Quick function key access to the editor or the menus — an instant on-line help screen summarizing all Telewriter commands and special characters — an option file where you store your personal set of format and screen settings so you only have to set them once!

Then, there's a quick save feature which allows you to save all your current work without leaving the editor. There's a simple way to cursor through the disk directory and read in a file by just hitting ENTER. And there's more.

NEW POWER

Telewriter-64 always had the power to handle any kind of serious writing, from letters to textbooks. But, here too, Telewriter-128 adds major features.

Like Macros — which let you insert whole words or phrases (even sets of control codes or format commands) into your text, with a single keypress. And every time you power up Telewriter-128, the macro definitions are automatically loaded*, so they're always there.

Then there's a Print Preview feature that shows you, on-screen, the way your printed text will look — with margins, headers, centering, justification, page numbering, and page breaks. This guarantees letter perfect documents every time, and makes tasks like widow/orphan line elimination, a breeze.

TELEWRITER-64 OR TELEWRITER-128

We could go on listing features, but the point is this: If you own a Color Computer, you already have the hardware for the most powerful, low cost word processor in town. All you need now is to add the heart and soul:

Telewriter-64, for the Color Computer 1 and 2, costs $59.95 on disk, $49.95 on cassette.

Telewriter-128 for the Color Computer 3 costs $79.95 on disk, $69.95 on cassette.

To order by Mastercard or Visa call (619) 755-1258 anytime, or send check or money order plus $2 shipping (Californians add 6% sales tax) to:

COGNITEC
704 Nob Ave.
Del Mar, CA 92014

To upgrade from Telewriter-64 to Telewriter-128, return your original disk or cassette with $39.95. (Add $10 if you're also upgrading from cassette to disk. Deduct $10 with proof of Oct '87 - Feb '88, purchase of Telewriter-64.)

> *When I first got Telewriter-64 last year, I was in heaven. I couldn't believe the program's versatility and ease of use.*
> -The RAINBOW, Oct. 1985

TELEWRITER-64 FEATURES: Compatibility with any printer that works with the Color Computer; embedded control codes for underlining, boldface, sub/superscript, variable fonts; format commands for headers, centering, margin and spacing changes anywhere in the document; Format menu to set margins, spacing, page numbering, BAUD rate, lines per page, justification; Chain printing for one shot printing of multi-file documents. Fast, full-screen editor with wordwrap, block copy/move/delete, global search and replace, wild card search, fast 4-way auto-repeat cursor, fast scrolling, forward and backward paging, text alignment, tabs, error protection, word and line counter. Insert or delete text anywhere on the screen. Simple, easy to remember commands. Optional ASCII files for compatibility with spell checkers, terminal programs, and BASIC. Load, save, append, partial save files to disk or cassette. Kill, rename and list disk files. Cassette verify and auto-retry on error.

TELEWRITER-128 - ADDITIONAL FEATURES: Print preview from editor; multiple copy print; footers; hanging indents; cursor thru disk directory to load, append, rename and kill files; quick file save from editor; keyclick; key repeat; true block move; 24, 25, or 28 line screen; 40 or 80 column screen; dual speed cursor; on-line help; overstrike mode; word delete; wordwrap at margin; user definable macros; nested macros; instant status window for information on cursor position, word count, etc.; instant function key access to menus or editor; options menu for setting character and screen colors, key repeat and delay rates, definable foreign symbols.

RAINBOW
CERTIFICATION
SEAL

IBM and PS/2 are trademarks of International Business Machines Inc. *disk version only

The only tricky part of the program is the array-in/array-out routine that allows input on a text screen and output for the graphics screen. The CoCo 3 version is written for an RGB monitor, and you may have to adjust the colors for a TV set or a composite monitor. Next month I'll give you the solution, if you haven't mastered the problem by then.

(Questions or comments regarding this program may be directed to the author at 101 Forrer Blvd., Dayton, OH 45419. Please enclose an SASE when requesting a reply.) ☐

170	125	780	119
350	72	960	23
570	51	END	83

Listing 1: BALL3

```
5 REM BALL3 BY BRUCE W. RONALD
10 DIM LH(6):DIM RH(6)
20 DATA 0,0,0,0,0,0,0,0,0,0,0,0
30 HBUFF 1,3618:HBUFF 2,3618
40 X=RND(-TIMER)
50 X=RND(12):Y=RND(1000)
60 IF Y>=500 THEN Y1=1
70 IF Y1=1 THEN Y$="HEAVY"
80 IF Y<500 THEN Y1=-1
90 IF Y1=-1 THEN Y$="LIGHT"
100 PALETTE RGB:WIDTH 40:CLS3:AT
TR3,2:REM CHANGE THIS FOR COMPOS
ITE MONITOR
105 PALETTE6,40:PALETTE7,38:PALE
TTE5,45
110 PRINT:PRINT:PRINT
120 PRINT"  The Case of the Dev
iant Pool Ball"
130 PRINT:PRINT:PRINT:PRINT:PRIN
T"One ball is either";:ATTR3,2,B
:PRINT" HEAVIER";
140 ATTR3,2:PRINT " or";:ATTR3,2
,B:PRINT" LIGHTER"
150 PRINT:PRINT:PRINT
160 ATTR3,2:PRINT:PRINT"YOU HAVE
 3 WEIGHINGS TO DETERMINE WHICH
";
163 PRINT"BALL AND IF IT IS HEAV
IER OR";
165 PRINT" LIGHTER    THAN THE O
THERS"
170 FOR T=1 TO 1900:NEXT T
180 LOCATE26,20:PRINT"HERE WE GO
"
190 FOR T=1 TO 800:NEXT T
200 CLS:FOR C=1 TO 4
210 WIDTH40:CLS3:ATTR3,2
220 IF C=1 THEN A$="          WE
IGHING ONE"
230 IF C=2 THEN A$="          WE
IGHING TWO"
240 IF C=3 THEN A$="          WE
IGHING THREE"
245 IF C=4 THEN GOTO 500
250 R=0:L=0:FOR W=1 TO 6: READ L
H(W):NEXT W
260 FOR U= 1 TO 6: READ RH(U):NE
XT U
270 PRINT:PRINT:PRINTA$
280 PRINT:INPUT"TOTAL NUMBER OF
BALLS ON each SIDE";N
290 FOR E=1 TO N
300 PRINT:INPUT"NUMBER OF BALL O
N LEFT SIDE";B
310 GOSUB 620
320 IF B=X THEN L=Y1
330 LH(E)=B
340 NEXT E
350 FOR E=1 TO N
360 PRINT:INPUT"NUMBER OF BALL O
N RIGHT SIDE";B
370 GOSUB 620
380 IF B=X THEN R=Y1
390 RH(E)=B
400 NEXT E
410 H=144:V=80
420 GOSUB 640
430 HGET(10,61)-(155,108),1:HGET
(165,61)-(310,108),2
440 V1=61:V2=61
450 IF L>R THEN GOSUB 1010
460 IF L<R THEN GOSUB 1080
470 IF L=R THEN HPRINT (11,23),"
THE SCALE BALANCES"
480 FOR LA=1 TO 600:NEXT LA
490 NEXT C
500 CLS3:ATTR3,2:PRINT:PRINT:PRI
NT:PRINT
510 PRINT"      WHAT IS YOUR ANS
WER?"
520 INPUT"      WHICH BALL IS DE
VIANT";J
530 IF J=X THEN PRINT"CONGRATULA
TIONS" ELSE IF J<>X GOTO 570
540 PRINT"      Is it Heavier or
 Lighter?
550 INPUT"      ENTER H OR L";J$
560 IF J$=LEFT$(Y$,1) THEN PRINT
"RIGHT AGAIN":GOTO 590
570 PRINT"SORRY,IT WAS" ;X;" AND
 IT WAS ";Y$:GOTO 590
580 PRINT"SORRY.IT WAS ";Y$
590 INPUT"ANOTHER EXAMPLE";K$
600 IF K$="Y" THEN PRINT"TYPE 'R
UN' (AVOIDS DD ERROR IN 10)
605 IF K$="N" THEN PRINT"THAMKS,
 POOL BALL FANS"
610 END
620 IF B<1 OR B>12 THEN PRINT"BA
LL MUST BE NOT < 1 NOR > 12"
625 IF B<1 OR B>12 THEN PRINT "P
RESS BREAK AND RUN AGAIN"
630 RETURN
```

```
640 REM GRAPHICS
650 HSCREEN2
660 HCOLOR 12,11
670 HDRAW"BM10,92;C12;R146;U74;R
8;D74;R146;D8;L146;D74;L8;U74;L1
46;U8"
680 HPAINT(14,95),3,12
690 FOR F=1 TO N
700 B=LH(F):GOSUB 800
710 IF F<N THEN H=H-24
720 NEXT F
730 H=176
740 FOR G=1 TO N:B=RH(G):GOSUB 8
00
760 IF G<N THEN H=H+24:NEXT G
780 RESTORE:RETURN
800 IF B=8 THEN HCIRCLE(H,V),11,
13
810 IF B=8 THEN HCIRCLE(H,V),4,1
3
820 IF B<>8 THEN HCIRCLE(H,V),11
,12
830 IF B<8 THEN HCIRCLE(H,V),4,1
2
840 IF B>8 THEN HLINE(H-3,V-11)-
(H-3,V+11),PSET
850 IF B>8 THEN HLINE(H+3,V-11)-
(H+3,V+11),PSET
860 GOSUB 880
870 RETURN
880 IF B=1 THEN HPAINT(H-8,V),1,
12
890 IF B=2 THEN HPAINT(H-8,V),2,
12
900 IF B=3 THEN HPAINT(H-8,V),3,
12
910 IF B=4 THEN HPAINT(H-8,V),6,
12
920 IF B=5 THEN HPAINT(H-8,V),7,
12
930 IF B=6 THEN HPAINT(H-8,V),9,
12
940 IF B=7 THEN HPAINT(H-8,V),5,
12
950 IF B=8 THEN HPAINT(H-8,V),12
,13
960 IF B=9 THEN HPAINT(H,V),1,12
970 IF B=10 THEN HPAINT(H,V),2,1
2
980 IF B=11 THEN HPAINT(H,V),3,1
2
990 IF B=12 THEN HPAINT(H,V),6,1
2
1000 RETURN
1010 FOR M=1 TO 10
1020 V1=V1+4:V2=V2-4
1030 HPUT(10,V1)-(155,V1+47),1,P
SET
1040 HPUT(165,V2)-(310,V2+47),2,
PSET
```

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```
1050 NEXT M
1060 HPRINT(1,23),"LEFT SIDE HEA
VIER OR RIGHT SIDE LIGHTER"
1065 FOR LA=1 TO 600:NEXT LA
1070 RETURN
1080 FOR M=1 TO 10
1090 V1=V1-4:V2=V2+4
1100 HPUT(10,V1)-(155,V1+47),1,P
SET
1110 HPUT(165,V2)-(310,V2+47),2,
PSET
1120 NEXT M
1130 HPRINT(1,23),"RIGHT HAND HE
AVIER OR LEFT HAND LIGHTER"
1135 FOR LA=1 TO 600:NEXT LA
1140 RETURN
```

✓
90 168
260 240
1340 231
END 57

Listing 2: BALL2

```
3 X=RND(-TIMER)
5 DIM LH(0,175):DIM RH(0,175)
7 PRINT:PRINT
10 PRINT:PRINT:PRINT:PRINT"THIS
IS A TOOL TO DETERMINE IF"
11 PRINT"YOUR TECHNIQUE CAN SOLV
E THE 12"
12 PRINT"POOL BALL PROBLEM"
15 PRINT"IT WILL ALLOW YOU TO WE
IGH UP"
16 PRINT"TO SIX BALLS ON EITHER
SIDE"
17 PRINT"(SILLY, BUT ALLOWED)
20 PRINT"THE RESULTS OF EACH WEI
GHING    WILL BE DISPLAYED."
25 PRINT"CAN YOUR TECHNIQUE SOLV
E every  POSSIBILITY?"
30 INPUT "READY (Y/N)";A$
35 IF A$="Y" THEN CLS
40 X=RND(12):Y=RND(1000)
45 IF Y>501 THEN Y$="HEAVY"
48 IF Y<500 THEN Y$="LIGHT"
50 IF Y$="HEAVY" THEN Z=1
55 IF Y$="LIGHT" THEN Z=-1
60 FOR W=1 TO 4
65 IF W=1 THEN W$="ONE"
70 IF W=2 THEN W$="TWO"
75 IF W=3 THEN W$="THREE"
80 IF W=4 GOTO 240
90 CLS:PRINT:PRINT:PRINT"      WE
IGHING ";W$
95 L=0:R=0
100 PRINT:INPUT "HOW MANY BALLS
DO YOU WISH ON   each SIDE OF TH
E FULCRUM";N1
105 PRINT
106 FOR E=1 TO N1
110 INPUT "NUMBER OF BALL ON LEF
T";LB
120 GOSUB 1600
130 NEXT E
160 PRINT:FOR F=1 TO N1
170 INPUT "NUMBER OF BALL ON RIG
HT SIDE";RB
180 GOSUB 1650
190 NEXT F
221 PRINT
225 GOSUB1000
230 NEXT W
240 CLS:PRINT:PRINT:PRINT:INPUT
"WHICH BALL IS DIVIANT";A1
245 IF A1><X THEN PRINT"SORRY. T
HE BALL WAS"; X; "AND IT WAS ";
Y$: INPUT"TRY AGAIN(Y/N)";I$:GOT
O 270
250 IF A1=X THEN INPUT "RIGHT. H
eavy or Light";A1$
260 IF A1$=LEFT$(Y$,1) THEN PRIN
T "RIGHT AGAIN"
261 IF A1$="" THEN 260
262 IF A1$<>LEFT$(Y$,1) THEN PRI
NT"SORRY. IT WAS";Y$
265 INPUT "ANOTHER EXAMPLE?(Y/N)
```

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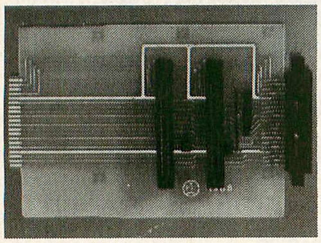

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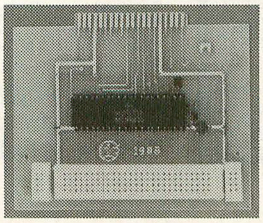

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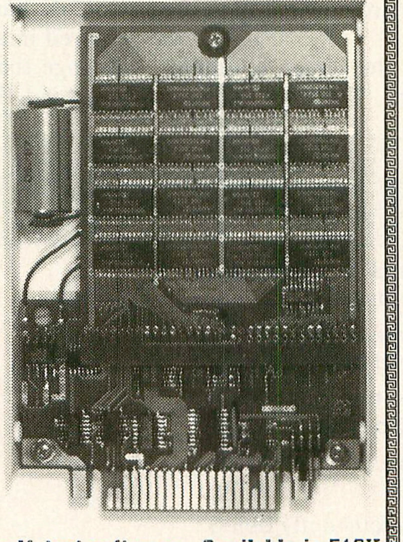
```
";I$
270 IF I$="Y" THEN GOTO 40
280 IF I$=" " THEN GOTO 280
290 IF I$="N" THEN PRINT "END"
295 END
1000 PMODE 3,1:PCLS
1010 SCREEN 1,1:COLOR 2,1
1020 DRAW "C3;BM 0,96;D8;R123;D6
0;R8;U60;R123;U8;L123;U84;L8;D84
;L123"
1030 PAINT(4,100),4,3
1040 V=84:H=106
1050 FOR G=1 TO N1
1060 CIRCLE(H,V),11,3
1070 H=H-20:IF N1=G THEN GOTO 12
00
1080 NEXT G
1200 H=148:FOR G=1 TO N1
1210 CIRCLE(H,V),11,3
1220 H=H+20:IF N1=G THEN GOTO 13
00
1230 NEXT G
1300 REM FILLS IN MISSING LINE
1310 GET(0,66)-(123,114),LH,G
1320 GET(133,66)-(256,114),RH,G
1325 V1=64:V2=64:H1=0:H2=123:H3=
133:H4=256
1330 IF L=R GOTO 1340 ELSE 1350
1340 FOR T=1 TO 300:NEXT T:PRINT
@480,"THE SCALE BALANCES"
1345 FOR U= 1 TO 800:NEXT U
1350 IF L>R THEN GOSUB 1400
1360 IF L<R THEN GOSUB 1500
1370 RETURN
1400 FOR M=1 TO 7
1410 V1=V1+8:V2=V2-8
1430 PUT(H1,V1)-(H2,V1+48),LH,PS
ET
1440 PUT(H3,V2)-(H4,V2+48),RH,PS
ET
1450 NEXT M
1480 PRINT@448,"LEFT HAND SIDE H
EAVIER":FOR T= 1 TO 800:NEXT T
1490 RETURN
1500 FOR M= 1 TO 7
1510 V1=V1-8:V2=V2+8
1520 PUT(H1,V1)-(H2,V1+48),LH,PS
ET:PUT(H3,V2)-(H4,V2+48),RH,PSET
1530 NEXT M
1560 PRINT@448, "RIGHT HAND SIDE
 HEAVIER":FOR T= 1 TO 800:NEXT T
1570 RETURN
1600 IF LB=X THEN L=Z
1610 RETURN
1650 IF RB=X THEN R=Z
1660 RETURN
```



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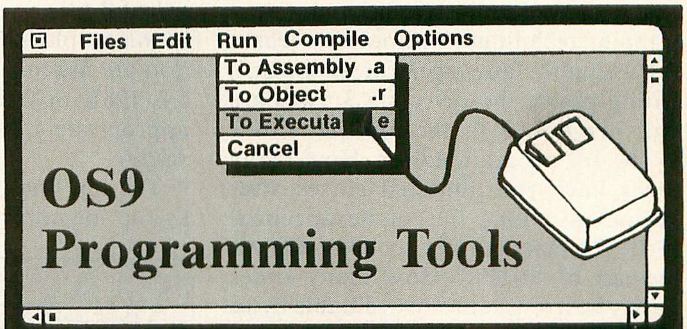

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A program editor for the CoCo 3

CoCo's Current Companion

By Marc Campbell

Since the entry of the CoCo 3 into the world of microcomputing, the capabilities of amateur programmers have increased significantly. Every Joe Average Hacker with access to a Color Computer can now utilize 640-by-192 resolution graphics, 64 colors, 80-column screens, and error-trapping techniques without ever learning assembly language. For all CoCo's strong points, however, its 3 users are still plagued with the antique Color BASIC 1.0 program editor. How many times have you muttered curses after keying in a long line of hexadecimal DATA statements only to press CLEAR instead of ENTER? How many times have you irrevocably lost valuable bytes of code with the clumsy EDIT command? How many times have you dreamed of full-fledged cursor control with auto-key repeat?

Buddy is a program editor worthy of the Color Computer 3. Don't be fooled by its juvenile name or cartoon-like title screen; *Buddy* is quite a powerhouse. It supports 40- and 80-column text, disk and tape systems, and 128K or 512K machines. With 49,000 bytes (128K) or 442,250 bytes of workspace (512K), you will be limited only by the amount of memory the computer allocates to BASIC (usually 24,872 bytes). In addition, *Buddy* possesses many of the advanced editing features of expensive word processors. Simply key in Listing 1 (knowing that it may be the last time you will ever need to use the original BASIC editor) and save it to tape or disk.

To execute the program, type RUN and press ENTER. You will be greeted by a colorful title screen in 320-by-192 resolution graphics. Press any key to begin. You are asked to press 1 if your CoCo has 128K or 2 if it has 512K; respond appropriately. You are now ready to use *Buddy*.

The top line on the screen is known as the memory bar. The first number displayed is the number of 250-character lines that may be entered into memory. The second number tells you how many more characters may be entered on the current line. The various letters you will find on the memory bar will be explained later.

Entering Text

Buddy allows you to enter program lines as you normally would using the CoCo's built-in editor. Lines may be entered in any order; the computer will arrange them in numerical order when you load the program into BASIC. No

Marc Campbell, a self-taught programmer, is a senior in high school, where he participates in drama and is an editor and award-winning writer for the school newspaper.

Variable Descriptions

A$	Contains character of key pressed	R$	Replacement string
C$	Name of the command being executed	RT$	Right portion of a line
CL$	Line that has been cut and pasted	T$	Target string
E$	PLAY string for error tone	AL	Returns a 1 if automatic line numbering is on
L$	Line currently being edited	AZ	Dummy variable
LN$	Line being manipulated by a command	BK	Background palette color
LT$	Left portion of a line	C	Printout width
NB$	Line number being searched for	CH	Character's palette color
P$	PLAY string for key click tone	CP	Returns a 1 if cut and paste is on
Q$	Dummy variable	CW	Command window palette color
		DV	Input/output device number

two lines may have the same number; although *Buddy* will recognize them as separate lines, BASIC will not.

For now, type in a line of BASIC code (you *must* include a space after the line number), but do not press ENTER just yet. *Buddy* allows for four-directional cursor control. Move the cursor left, right, up, and down by pressing the appropriate arrow key. (The CLEAR key generates an up-arrow character.) Holding down an arrow key speeds the cursor through your text automatically. You may edit any portion of the line simply by positioning the cursor and typing over the old text. (Since the LOCATE command wipes out the character under the cursor, some of your line may seem to vanish. Press SHIFT and the left arrow key to reprint the line in its entirety.)

Suppose you want to delete a character in your line. Position the cursor under the character you want erased and press F1. *Voila!* The character never knew what hit it. (Notice how the rest of the line moves over one space to the left to fill the gap.) To insert a space in the line, position the cursor under the character you want the space to precede and press F2.

If you want to lop off part of the line you're entering, press SHIFT-F2. The character under the cursor and everything after it are deleted.

At the moment, *Buddy* is operating in overstrike mode, which means characters that are typed over are replaced. By pressing ALT, you may enter the insert mode. (The O for overstrike on the memory bar turns to an I for insert.) Position the cursor under a character in your line, enter insert mode, and type several characters. Notice how insert mode works; the rest of the line is pushed one space to the right to make room for the new characters. The keyboard does not respond as quickly in insert mode as it does in overstrike, so take your time when typing. You may not begin a line in insert mode; return to overstrike mode by pressing ALT again.

As you know, the CoCo 3 is capable of producing true lowercase letters. Press SHIFT-0 to toggle between uppercase mode (all caps) and lowercase mode (mixed). The memory bar returns a U for uppercase or L for lowercase, depending on the mode you are in.

If you have ever typed in a program from THE RAINBOW, you know that the magazine formats program listings in 32 columns. This way, you can check to see if the position of the character at the far right of your 32-column screen matches the position of the one in the magazine as a method of proofreading your own work. Press SHIFT-CTRL to see the line you are currently typing on a 32-column screen. You may not edit on the 32-column screen; press any key to return to the editor.

Now that you have experimented with some of the program's features, position the cursor wherever you want the line to end and press ENTER. You are asked if you are finished with the current line; press Y for yes or N for no. If you choose no, you will be returned to the line. Press SHIFT and the left arrow key to restore any erased characters, and continue editing. If you select yes, the line is sent to memory. After a moment's wait, the screen will clear and you may enter another line.

Commands

Press CTRL and you will be sent into command mode. A portion of the screen called the command window is blocked off, and you will be prompted to enter a command. There are nineteen commands recognized by *Buddy*. At any time during a command, press ESC/BREAK to return control to the editor. (The proverb made famous by *Telewriter*, "When in doubt press BREAK," applies.) All of the command procedures are well-prompted in plain English messages for maximum user-friendliness.

A (Automatic Line Numbering): This command toggles the automatic line numbering feature. Specify the starting line number and the interval of increase, and *Buddy* takes care of the rest. For instance, if you define the starting line as 10 and the interval as 20, the computer would number your program's

ED	Returns a 1 if edit mode is on
EE	Length of line being cut and pasted
EL	End position of line being edited
EN	End position of portion being cut
I	Returns a 1 if insert mode is on
IC	Increment of automatic line numbering
IR	Returns a zero if no occurrences of target found
L	Maximum number of lines
LC	Number of occurrences of target in line
LL(x)	Array containing the length of Line X
LN	Line number being searched for
LP	Position of cursor in line
LU	Number of lines used
LX	Line being edited
MU	Bytes of memory used
MX	Dummy variable
MY	Dummy variable
NC	Total number of occurrences of target
PL	Position in line being searched
PS	Memory position of search
PT	Position of editor in the program
Q	Dummy variable
QQ	Dummy variable
S	First address editor may LPOKE to
SR	Starting line of automatic line numbering
ST	Start of portion of line being cut
W	Width of editing screen
X	Horizontal position of cursor
XQ	Dummy variable
XX	Dummy variable
Y	Vertical position of cursor
Z	Returns a zero if line numbering was just turned on
ZZ	Dummy variable

lines as follows: 10, 30, 50, 70, 90, etc.

B (Return to BASIC): This command sends you back to BASIC.

C (Cut & Paste): This command lets you take part of a line and move it to another location. Upon executing this command, position the cursor at the beginning of the portion you want to cut, and press S for start position. Move the cursor to the end of the portion you want to cut and press E. Finally, position the cursor at the spot you want the cut portion to move and press M. After verification, the line will be cut and pasted.

D (Disk Directory): This command does a disk directory and displays the number of free granules remaining. Press any key to return to the editor.

E (Edit Line): This command allows you to edit a line you previously typed in. An E for edit mode will appear on the memory bar. You may not execute another command while in edit mode. Press ENTER to return to the normal mode of operation.

F (Find Text): This command causes the computer to search through memory for a target string. When it finds the string, it displays the line that contains the string and asks you if you want to continue the search. Press Y or N. The search continues until you abort by pressing N or no more occurrences can be found. If you do press N, you will be sent (in edit mode) to the line that contains the target string.

G (Global Replace): This command works like `Find Text` above, but the computer will change every occurrence of the target string it finds to a replacement string. If the replacement string plus the original line take up more than 250 characters, none of the occurrences in the line will be changed.

H (Alter Colors): This command changes the colors of the display. Input the palette color (0-63) for the characters, background and command window.

K (Kill Disk File): This command kills a file saved to disk.

L (Disk Load): This command loads any ASCII-saved program with the extension `.BAS` into memory so that *Buddy* may edit it. The loading process

Lines	Description
1 - 12	Draw the title screen. `POKE&HE67B,&H39:HSCREEN2: POKE&HE6B7,&H20` prevents the computer from switching to the Hi-Res screen while the actual drawing and painting is taking place. The line `POKE&HE6E4,&HE6:HSCREEN2:POKE&HE6E4,&HE7` undoes the previous pokes.
13 - 15	Initialize the program.
16 - 17	Prepare the computer for the incoming line.
18	Checks to see if a key is being pressed.
19	Generates an up arrow if CLEAR is pressed.
20	Hacks line at cursor if SHIFT-F2 is pressed.
21	Follows a routine if ENTER is pressed.
22	Deletes the character under the cursor if F1 is pressed.
23	Inserts a character at the cursor if F2 is pressed.
24	Jumps to command mode if CTRL is pressed.
25	Toggles between insert and overstrike modes if ALT is pressed.
26	Controls the cursor if the left arrow key is pressed.
27	Controls the cursor if the right arrow key is pressed.
28	Controls the cursor if the down arrow key is pressed.
29	Controls the cursor if the up arrow key is pressed.
30	Rewrites a line if SHIFT-left arrow is pressed.
31	Prints a line on 32-column screen if SHIFT-CTRL is pressed.
32	Sounds the error tone if an illegal key is pressed.
33	Stops the computer from accepting any characters if the workspace is filled. The computer jumps to Line 35 if it is in insert mode; otherwise, the character is added to the line.
34	Stops the computer from extending a line past 250 characters.
35	Prints the character of the key that was pressed.
36	Adds the character to the line if the computer is in insert mode; everything following it is shifted one space to the right.
37-38	Call a subroutine to prevent the computer from locating an illegal position.
39-41	Call a subroutine when ENTER is pressed.
42-47	Call a subroutine for auto-key repeat of cursor control.
48-53	Call an error-trapping routine.
54-58	Call a subroutine to print the memory bar.
59	Calls a routine for entering command mode. You are asked to select a command, provided you are not in edit mode.
60-78	Contain various commands; check the value of `C$` in each line to determine which command the line controls.
79	Sounds the error tone if an illegal command is selected, and the computer returns to Line 57.
80-88	Contain the global find and replace subroutine.
89-95	Contain the single-line find and replace subroutine.
96	Calls a subroutine to center the command name on the screen.
97-103	Find the text subroutine.
104	Reformats the editor screen and closes any open devices. Pressing ESC/BREAK sends you to this line.
105	Erases the command window and returns to the line being edited.
106-107	Contain an initialization routine for the automatic line numbering command.
108-111	Search for a particular line number.
112-113	Contain the output to printer routine.
114-115	Call a subroutine to generate a "Press any key to continue" prompt.
116-117	Call a subroutine to generate an "Are you sure? (Y/N)" prompt.
118-119	Contain the Save routine.
120-127	Contain the Load routine.
128-146	Contain the Cut and Paste routine.
147	Calls a subroutine to bypass the `CLOSE#1` command on non-disk systems, which would otherwise generate a DN Error.

will stop after the program is completely in memory or after the workspace is filled (whichever comes first).

M (Memory Used): This command displays the number of bytes your program consumes.

N (Erase Memory): This command clears the workspace, as the `NEW` command of BASIC.

P (Output To Printer): This command sends the program to your printer. You may specify the width of the printout.

Q (Key Click): This command toggles the key click feature.

R (Replace Text): This command works identically to Global Replace (CTRL-G) with one exception. Occurrences of the target string *in the current line only* will be replaced.

S (Disk Save): This command saves your program to disk under the extension `.BAS`.

T (Cassette Save): As Disk Save (CTRL-S) above, but output is to the cassette recorder.

U (Cassette Load): As Disk Load (CTRL-L) above, but the computer receives input from the cassette recorder.

W (Alter Width): This command toggles between 40 and 80 columns of text.

Error Messages

Using the `ON ERR GOTO` command, *Buddy* makes use of error-trapping for crash-free operation. The computer reports errors above the memory bar by printing WARNING: and the appropriate error message.

Out Of Range: You have input a number or string that is out of the computer's range (i.e., attempting to change the background to Color 100).

Overflow: More commonly called the "Wise Guy Error." You cause an overflow if you input a number that the computer cannot handle (anything larger than nine digits).

Input/Output Error: The computer is having difficulty reading or writing to your tape or disk. Check to make sure the device has been turned on.

Disk Error: Any number of things may be going wrong: the disk may not be formatted, the file you specified may not exist, the disk may have write-protection tabs on it, the disk may be garbled, etc. Physically examine your disk, or experiment with it in BASIC, to get to the source of the problem.

If the computer encounters an error that does not fit into any of these categories, you will be returned to the standard 32-column screen. On the top line you will find the error number and the line that is generating the error. There is probably a typographical error in the line somewhere, but more serious errors may be the result of an oversight on my part. Write me if you discover a chronic bug that you just can't squash.

Shortcomings

Since *Buddy* was written in BASIC, there are certain features of the built-in editor that my program cannot duplicate. For example, no matter if each line contains two or 200 characters, you'll

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never fit more than 196 lines (1769 lines with 512K) into memory. If the program you are keying in contains more than the maximum number of lines, save the first part to either tape or disk and erase memory (CTRL-N). Continue typing in the program until you are finished or until you fill the workspace again, saving each section under a different filename. When you have completed the program and all its components are saved, return to BASIC (CTRL-B). Load the first portion into memory. For disk systems, type `MERGE`*"filename*`.BAS`*"* for each additional component. Tape users should input the command `OPEN #-1,`*"filename"*`:POKE 111,255:EXEC &HAC7C` for each additional component. When the entire program is safely tucked away into memory, resave it to tape or disk.

If you ever want to delete a line that you have already sent to memory, I recommend you execute the Edit Line command (CTRL-E), position the cursor after the space that follows the line number, and press ENTER. This way, if you need room for another line, you may edit the "empty" line and change its line number.

(Questions or comments concerning this program may be directed to the author at 266 Riverview Drive, Ephrata, PA 17522. Please enclose an SASE when requesting a reply.) ☐

9	24	78	217
16	52	89	78
23	129	101	253
30	155	111	26
45	35	122	167
59	234	131	71
65	121	138	120
71	60	END	102

The listing: BUDDY

```
1 PCLEAR1:HSCREEN0:WIDTH32:PRINT
@202,"INITIALIZING":POKE&HE6B7,&
H39:HSCREEN2:POKE&HE6B7,&H20
2 POKE&HFFD9,0:ONBRKGOTO1:CMP:PA
LETTE9,15:HCLS5:HCOLOR8:HDRAW"BM
100,40R120F5D80G5L120H5U80E5":HD
RAW"BM110,50R100F5D60G5L100H5U60
E5":HDRAW"BM120,65E5R15BR40E5F10
":HDRAW"BM135,65G5F5R5U5":HDRAW"
BM180,70D5R5E5H5":HDRAW"BM165,65
D25L5"
3 HCIRCLE(160,93),35,,.15,0,.5:H
CIRCLE(160,93),35,,.5,0,.5
4 HPAINT(120,70),0,8:HPAINT(160,
108),4,8:HPAINT(97,70),4,8
5 HLINE(100,130)-(85,145),PSET:H
LINE-(235,145),PSET:HLINE-(220,1
30),PSET:HLINE(100,135)-(95,140)
,PSET:HLINE-(225,140),PSET:HLINE
-(220,135),PSET:HLINE-(100,135),
PSET
6 HPAINT(101,132),4,8:HPAINT(106
,138),9,8:HCOLOR3:HLINE(101,133)
-(120,133),PSET:HCOLOR8:HLINE(85
,145)-(235,150),PSET,B:HPAINT(86
,146),4,8
7 HPRINT(4,20),"THE FRIENDLY PRO
GRAMMING UTILITY"
8 HCOLOR4:HPRINT(4,22),"(C) MCML
XXXVIII BY MARC CAMPBELL"
9 HCOLOR8:HDRAW"BM35,10D20R50U5H
5E5U5NL50D20R50U20L20D10L10U10L2
0":HDRAW"BM135,10D20R45E5U10H5L4
5":HDRAW"BM185,10D20R45E5U10H5L4
5":HDRAW"BM235,10D10R20D10R10U10
R20U10L20D5L10U5L20"
10 HPAINT(36,11),1,8:HPAINT(86,1
1),1,8:HPAINT(136,11),1,8:HPAINT
(186,11),1,8:HPAINT(236,11),1,8
11 POKE&HE6E4,&HE6:HSCREEN2:POKE
&HE6E4,&HE7:A$=INKEY$:A$=""
12 IFINKEY$=""THENPALETTE1,Q:Q=Q
+1:IFQ=64THENQ=0:GOTO12ELSE12
13 ATTR0,0:WIDTH40:CMP:CLS1:CLEA
R2500:LOCATE2,10:PRINT"Are you u
sing (1) 128K or (2) 512K?":ONBR
KGOTO13
14 EXEC44539:A$=INKEY$:IFA$="1"T
HENL=196:S=393216ELSEIFA$="2"THE
NL=1769:S=0ELSEPLAY"V31L35O1C":G
OTO14
15 PLAY"L30O3C":DIMLL(L-1):PT=S:
W=40:E$="V31L35O1C":P$="V31L255O
1C":POKE&HFFD9,0:ONERRGOTO48:VER
IFYON:CH=0:BK=18:CW=63:ONBRKGOTO
104
16 ATTR0,0:PT=S+(250*LU):L$=STRI
NG$(250,0):EL=1:LP=1:X=0:Y=3:WID
THW:GOSUB54:IFAL=1ANDZ=0THENZ=LU
+1:L$=STR$(SR)ELSEIFAL=1ANDZ>0TH
ENL$=STR$(SR+IC*((LU+1)-Z))
17 IFAL=1THENL$=RIGHT$(L$,LEN(L$
)-1)+" ":EL=LEN(L$)+1:LP=EL:LOCA
TEX,Y:PRINTL$;:HSTATQ$,Q,X,Y:L$=
L$+STRING$(250-LEN(L$),0)
18 LOCATEX,Y:A$=INKEY$:IFA$=""TH
EN18ELSEPLAYP$:IFASC(A$)>31ANDAS
C(A$)<123ANDA$<>"^"ANDPEEK(343)<
>191ANDPEEK(341)<>191THEN33
19 IFA$=CHR$(12)THENA$="^":GOTO3
3
20 IFA$=CHR$(214)ANDLP<EL THENPR
INTSTRING$(7,13):MID$(L$,LP,250-
LP)=STRING$(250,0):EL=LP:IFED=0T
HENLL(LU)=EL:GOTO18ELSELL(LX)=EL
:GOTO18
21 IFA$=CHR$(13)THENPRINTSTRING$
(6,13):LOCATE(W-40)/2,11:PRINT"A
re you finished editing this lin
e (Y/N)":EXEC44539:A$=INKEY$:IFA
$="Y"ORA$="y"THEN39ELSELOCATE(W-
40)/2,11:PRINT:A$="":GOTO18
22 IFA$=CHR$(103)ANDEL>1ANDLP<>E
L ANDLP<249THENLF$=LEFT$(L$,LP):
RT$=MID$(L$,LP+1,250):L$=LEFT$(L
F$,LP-1)+RT$+CHR$(0):LOCATE0,3:P
RINTL$:EL=EL-1:GOSUB54:GOTO18ELS
EIFPEEK(343)=191THENPLAYE$:GOTO1
8
23 IFA$=CHR$(4)ANDEL<249ANDLP<>E
L THENLF$=LEFT$(L$,LP-1):RT$=MID
$(L$,LP,250):L$=LF$+" "+RT$:L$=L
EFT$(L$,250):LOCATE0,3:PRINTL$:E
L=EL+1:GOSUB54:GOTO18ELSEIFPEEK(
344)=191THENPLAYE$:GOTO18
24 IFA$=CHR$(189)THEN59
25 IFPEEK(341)=191ANDI=0THENI=1:
GOSUB54:GOTO18ELSEIFPEEK(341)=19
1ANDI=1THENI=0:GOSUB54:GOTO18
26 IFA$=CHR$(8)THENLP=LP-1:IFLP<
1THENLP=1:PLAYE$:GOTO18ELSEGOSUB
54:X=X-1:IFX<0THENX=W-1:Y=Y-1:GO
TO42ELSE42
27 IFA$=CHR$(9)THENLP=LP+1:IFLP>
EL THENLP=EL:PLAYE$:GOTO18ELSEIF
LP=251THENLP=250:PLAYE$:GOTO18EL
SEGOSUB54:X=X+1:IFX>W-1 THENX=0:
Y=Y+1:GOTO42ELSE42
28 IFA$=CHR$(10)THENLP=LP+W:IFLP
>EL THENLP=LP-W:PLAYE$:GOTO18ELS
EIFLP=251THENLP=250:PLAYE$:GOTO1
8ELSEGOSUB54:Y=Y+1:IFY>24THENY=2
4:GOTO42ELSE42
29 IFA$=CHR$(94)THENLP=LP-W:IFLP
<0THENLP=LP+W:PLAYE$:GOTO18ELSEG
OSUB54:Y=Y-1:IFY<0THENY=0:GOTO42
ELSE42
30 IFA$=CHR$(21)THENLOCATE0,3:PR
INTL$:GOTO18
31 IFA$=CHR$(1)THENWIDTH32:PRINT
L$:EXEC44539:A$=INKEY$:A$="":WID
THW:GOSUB54:PRINT:PRINTL$;:GOTO1
8
32 PLAYE$:GOTO18
33 IFLU+1>L THENPLAYE$:GOTO18ELS
EIFI=1THEN36ELSEMID$(L$,LP,1)=A$
:LP=LP+1:IFLP>EL THENEL=LP
34 IFLP=251THENPRINTA$;:PLAYE$:L
$=LEFT$(L$,250):LP=250:GOTO18
35 PRINTA$;:HSTATQ$,Q,X,Y:LOCATE
0,0:ATTR0,0,U:PRINT:GOSUB54:GOTO
18
36 IFEL<249ANDLP<>EL THENLF$=LEF
T$(L$,LP-1):RT$=MID$(L$,LP,250):
L$=LF$+A$+RT$:L$=LEFT$(L$,250):L
OCATE0,3:PRINTL$:EL=EL+1:MU=MU+1
:X=X+1:LP=LP+1:GOSUB37:GOSUB54:G
OTO18ELSEPLAYE$:GOTO18
37 IFX>W-1 THENX=0:Y=Y+1
38 RETURN
39 IFED=1THENED=0:LL(LX)=LP:LX=0
ELSELL(LU)=LP:LU=LU+1
40 MID$(L$,LP,250)=CHR$(13)+STRI
```

Happy Independence Day to all of our US Customers!

Wild & MV Version 2.0 Use "wildcards" with most OS9 commands, or rearrange your directory tree. Features recursive directory searches. Great for hard disks. $19.95

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R. S. B.

We broke out the champagne. It was revolutionary! Who ever thought you could run BASIC, in an OS9 window?

Everyone knows that BASIC and OS9 are incompatible. The commands are completely different. The floppy disks are completely different. BASIC programs won't run under OS9.

Future Shock

Some people say that they "hate" OS9. Many people who buy OS9 don't use it, because it's unlike anything they've ever seen before. Well, like it or not, Level 2 OS9 is the future of the CoCo. Even the newest games use OS9 now.

Burke & Burke has developed a new program, RSB, to help you take that first step towards falling in love with Level 2 OS9.

BASIC Clone?

The first time you run RSB, it copies your RS-DOS ROMs to an OS9 disk file. Our proprietary installation software converts this disk file to an OS9 "shell" that can be run like any other OS9 program. You can even program the CoCo to automatically use RSB as your "shell" whenever you start up OS9.

RSB won't run machine language programs, but you can use all of the familiar Super Extended BASIC™ commands and program statements. You can even take advantage of OS9's built-in "windows" to run several BASIC programs at once! And RSB runs at the full 2 MHz speed of the CoCo -- always.

If you have a Speech Sound PAK™, or a Super Voice™, RSB upgrades will allow you to use these devices to execute commands like PLAY and SOUND "NO HALT".

Break out the champagne. Break out the OS9. Break out **RSB** . $39.95

Hard Disk Mania Sweeps America!

Experts Blame "Incredibly Sane" Low-Cost, High-Performance Interface

This year, 1988, may go down in CoCo history as "The Year of the Hard Disk". Burke & Burke has provided hundreds of low-cost, high performance hard disk interfaces to a very hot Color Computer market in only six months!

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The CoCo XT hard disk interface from **Burke & Burke** lets you connect up to 2 low cost, PC compatible 5-120 Megabyte capacity hard drives to your CoCo. You buy the drive, Western Digital WD1002-WX1 or WD1002-27X (RLL) controller, and a case from the PC dealer of your choice. Just plug them into the CoCo XT, plug the CoCo XT into your Multi-PAK, and you have a 20 Meg OS9 hard disk system for **under $450!**

Great for multi-user systems! The CoCo XT interface uses advanced "NO HALT" hard disk controllers, which do not halt your CoCo and do not disable or use interrupts during hard disk access. You get full type-ahead, and the system clock does not lose time during hard disk access. Fully compatible with most RS-232 expansion ports!

CoCo XT (with anodized housing, 60 page user manual, hard disk back-up utility and new, Version 2.1 drivers for use with both OS9 & HYPER-I/O) -- $69.95. Or choose the **CoCo XT-RTC** (includes real-time clock / calendar with battery backup) -- $99.95

THE PROFESSIONAL TOUCH: XT-ROM -- Automatically boots and reboots OS9 from hard disk. Installs in your hard disk controller's BIOS ROM socket -- $19.95.

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"Dynamic Disk Interface" runs hard drives, big floppies, and more!

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RAINBOW CERTIFICATION SEAL

```
NG$(250-LP,0):FORQ=1TO250:LPOKEP
T,ASC(MID$(L$,Q,1)):PT=PT+1:NEXT
41 GOTO16
42 LOCATEX,Y:PLAYP$
43 IFPEEK(343)=247THEN26
44 IFPEEK(344)=247THEN27
45 IFPEEK(342)=247THEN28
46 IFPEEK(341)=247THEN29
47 GOTO18
48 GOSUB147:CLOSE#-1:POKE&HFFD9,
0:ATTR0,0,U:LOCATE0,0:PRINT"WARN
ING: ";:IFERNO=4THENPRINT"Out of
 Range":GOTO105
49 IFERNO=5THENPRINT"Overflow":G
OTO105
50 IFERNO=20THENPRINT"Input/Outp
ut Error":GOTO105
51 IFERNO=23THENPRINT"Not in ASC
II Format":GOTO106
52 IFERNO>25ANDERNO<38THENPRINT"
Disk Error":GOTO105
53 WIDTH32:PRINTERNO,ERLIN:END
54 LOCATE0,0:ATTR0,0,U:PRINT:LOC
ATE0,1:PRINT"BUDDY ";L-LU;250-LP
;
55 IFPEEK(282)=0THENPRINT"L";ELS
EPRINT"U";
56 IFI=1THENPRINT" I";ELSEPRINT"
 O";
57 IFED=1THENPRINT" E"ELSEPRINT
58 ATTR0,0:RETURN
59 IFED=1THENPLAYE$:GOTO18ELSELO
CATE0,11:ATTR0,4:PRINTSTRING$(12
,13);:LOCATE(W-19)/2,11:PRINT"Se
lect a command: ";:EXEC44539:A$=
INKEY$:PRINTA$
60 IFA$="W"ORA$="w"THENC$="Alter
 Screen Width":GOSUB96:INPUT"Wou
ld you like 40 or 80 columns";Q:
Q=INT(Q):IFQ=40THENW=40:GOTO104E
LSEIFQ=80THENW=80:GOTO104
61 IFA$="H"ORA$="h"THENC$="Alter
 Colors":GOSUB96:PRINT"Current C
olors:"CH;BK;CW:INPUT"Characters
, background, command window";CH
,BK,CW:CH=INT(CH):BK=INT(BK):CW=
INT(CW):PALETTE0,BK:PALETTE8,CH:
PALETTE4,CW:GOTO104
62 IFA$="Q"ORA$="q"THENC$="Key C
lick":GOSUB96:INPUT"Key click (1
) on or (2) off";Q:Q=INT(Q):IFQ=
1THENP$="V31L25501C":GOTO105ELSE
IFQ=2THENP$="":GOTO105
63 IFA$="E"ANDLU>0ORA$="e"ANDLU>
0THENC$="Edit Line":GOSUB96:GOTO
108
64 IFA$="B"ORA$="b"THENC$="Retur
n to BASIC":GOSUB96:PRINT"Are yo
u sure you want to exit? (Y/N)";
:EXEC44539:I$=INKEY$:IFI$="Y"ORI
$="y"THENWIDTH32:POKE&HFFD8,0:AT
TR0,0:CMP:ENDELSE105
65 IFA$="M"ORA$="m"THENMR=0:C$="
Memory Used":GOSUB96:FORQ=0TO195
:MR=MR+LL(Q):NEXT:PRINT"The prog
ram uses"MR"bytes.":GOSUB114:GOT
O105
66 IFA$="S"ANDLU>0ORA$="s"ANDLU>
0THENIFPEEK(188)=14THENLN$="":XX
=0:C$="Disk Save":GOSUB96:DV=1:G
OSUB118:GOTO104
67 IFA$="T"ANDLU>0ORA$="t"ANDLU>
0THENLN$="":XX=0:C$="Cassette Sa
ve":GOSUB96:DV=-1:GOSUB118:GOTO1
04
68 IFA$="L"ORA$="l"THENIFPEEK(18
8)=14THENLN$="":XX=0:C$="Disk Lo
ad":GOSUB96:DV=1:GOSUB120:GOTO10
4
69 IFA$="U"ORA$="u"THENLN$="":XX
=0:C$="Cassette Load":GOSUB96:DV
=-1:GOSUB120:GOTO104
70 IFA$="K"ORA$="k"THENIFPEEK(18
8)=14THENC$="Kill Disk File":GOS
UB96:LINEINPUT"What is the filen
ame? ";F$:F$=LEFT$(F$,8)+".BAS":
POKE&HFFD8,0:KILLF$:GOTO104
71 IFA$="G"ANDLU>0ORA$="g"ANDLU>
0THENC$="Global Replace":GOSUB96
:HSTATQ$,Q,MX,MY:LINEINPUT"Targe
t text: ";T$:LOCATEMX,MY:PRINTST
RING$(7,13):LOCATEMX,MY:LINEINPU
T"Replacement: ";R$:GOTO80
72 IFA$="D"ORA$="d"THENIFPEEK(18
8)=14THENC$="Disk Directory":GOS
UB96:GOSUB114:ATTR0,0:WIDTHW:POK
E&HFFD8,0:DIR:PRINT"Free granule
s:"FREE(0):POKE&HFFD9,0:GOSUB115
:GOTO104
73 IFA$="C"ORA$="c"THENC$="Cut &
 Paste":GOSUB96:CP=1:GOSUB108:EE
=LL((Q-S)/249)-1:PRINT"Line"LN"f
ound.":LN$="":FORQQ=Q TO Q+249:L
N$=LN$+CHR$(LPEEK(QQ)):NEXT:GOTO
128
74 IFA$="R"ANDLU>0ORA$="r"ANDLU>
0THENC$="Replace Text":GOSUB96:G
OTO89
75 IFA$="F"ANDLU>0ORA$="f"ANDLU>
0THENC$="Find Text":GOSUB96:LINE
INPUT"Target text: ";T$:GOTO97
76 IFA$="N"ORA$="n"THENC$="Clear
 Memory":GOSUB96:LOCATE(W-20)/2,
22:PRINT"Are you sure? (Y/N)";:E
XEC44539:A$=INKEY$:IFA$="Y"ORA$=
"y"THEN13
77 IFA$="A"ORA$="a"THENC$="Autom
atic Line Numbering":GOSUB96:INP
UT"Would you like it (1) on or (
2) off";Q:Q=INT(Q):IFQ=1THENAL=1
:GOTO106ELSEIFQ=2THENAL=0:GOTO10
5
```

Sugar Software

☞ Just For the Fun of It ☜

Order any item by August 31, 1988 and you may have your choice of either the **Silly Syntax** *story creation game* (including two stories) or the **Flying Tigers** *arcade game* for only **$2.95!**

CALLIGRAPHER

CoCo Calligrapher - (Hybrid BASIC/ML) Turn your CoCo and dot-matrix printer into a calligrapher's quill. Make beautiful invitations, flyers, certificates, labels and more. Includes 3 fonts: *Gay Nineties, Old English* and *Cartoon*. The letters are ½ inch high and variably spaced. Works with many printers including Epson, Gemini, Radio Shack, Okidata 92A, Banana and Prowriter. Additional fonts are available (see below). Tape/Disk; **$24.95.**

OS9 Calligrapher - (C) Although a different program from the CoCo Calligrapher, the OS9 Calligrapher prints all the same fonts. It reads a standard text file which contains text and formatting directives. You may specify the font to use, change fonts at any time, centering, left, right or full justification, line fill, margin, line width, page size, page break and indentation. Similar to *troff* on UNIX systems. Includes Gay Nineties, Old English and Cartoon fonts. Additional fonts are available (see below). Disk only; OS9 Level I or II; **$24.95.**

Calligrapher Fonts - Requires Calligrapher above. Each set on tape or disk; specify RSDOS or OS9 version; **$14.95** each. **Set #1** - (9 fonts) Reduced, reversed and reduced-reversed versions of Gay Nineties, Old English and Cartoon; **Set #2** - (8 fonts) Old Style and Broadway; **Set #3** - (8 fonts) Antique and Business; **Set #4** - (8 fonts) Wild West and Checkers; **Set #5** - (10 fonts) Stars, Hebrew and Victorian; **Set #6** - (8 fonts) Block and Computer; **Set #7** - (5 *small* fonts) Roman, Italics, Cubes, Digital and Old World.

Economy Font Packages on disk; specify RSDOS or OS9; **29.95**: **Font Package #1** - Above font sets 1, 2 and 3 (25 fonts) on one disk. **Font Package #2** - Above font sets 4, 5 and 6 (26 fonts) on one disk. Both Packages #1 and #2 (51 fonts) on one disk; **49.95.**

Calligrapher Combo Package - Includes the Calligrapher and both Economy Font Packages, 54 fonts in all; specify RSDOS or OS9; **$69.95.**

Sample Calligrapher Fonts

The CoCo Calligrapher!

INFORMATION MGT.

TIMS (The Information Management System) - (Hybrid BASIC/ML) Tape or disk, fast and simple general data base program. Create *files* of *records* that can be quickly sorted, searched, deleted and updated. Powerful printer formatting. Up to 8 *user* fields, sort on up to 3 fields. Tape/Disk; **$19.95.**

TIMS Mail - (Hybrid BASIC/ML) Tape or Disk based mailing list management program. Files are compatible with TIMS. Fast and simple to use. Supports labels 1, 2 or 3 across, 2½ to 4 inches wide. Tape/Disk; **$19.95.**

TIMS Utility - (Hybrid BASIC/ML) Utility companion for TIMS and TIMS Mail for multi-term search (*AND* and *OR* logic), global change and delete, split large files and more! Tape/Disk; **$14.95.**

TIMS Combo Package - All three of the above programs: TIMS, TIMS Mail and TIMS Utility on one disk - **$34.95.**

UTILITIES

OS9 Patcher - (C) Display and modify the contents of a file or memory module. Calculates module CRCs; Disk only; OS9 Level I or II; **$19.95.**

Color Disk Manager - (100% ML) Disk utility with these features: Disk repair, selective track initialization, verify sectors, backups, tape to disk transfer, ROM Pak execution from disk, much more! Tape/Disk; CoCo 1, 2, 3 (except for 64K mode); **$24.95.**

EDUCATIONAL

Trig Attack - (100% ML) Ages 9 and up. In this educational arcade game, enemy *trigs* travel along math curves. Players learn important mathematical concepts as they play. Sound effects, colorful graphics. Excellent manual includes an introduction to trigonometry. Tape 16K CB/Disk 32K ECB; CoCo 1, 2, 3; **$19.95.**

The Educational Combo - The Combo includes these educational (and entertaining) games:
Silly Syntax (ages 5 and up) story creation game with 2 stories
Galactic Hangman (ages 7 and up) animated graphics, with a 700 word vocabulary
The Presidents of the USA (ages 10 and up) a presidential trivia game
The Great USA (ages 9 and up) a trivia game of the states
Trig Attack (ages 9 and up) Zap those *Trigs*
All five programs on one disk; **$49.95.**

SPECIAL INTEREST

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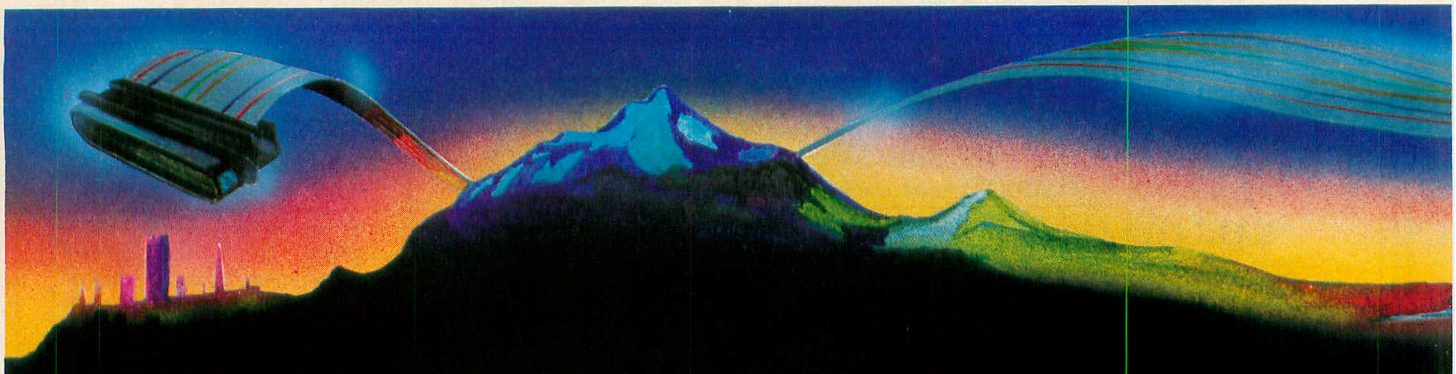
All programs run on the CoCo 1, 2 and 3, 32K Extended Basic, unless otherwise noted. Add $1.50 per tape or disk for shipping and handling. Florida residents add 6% sales tax. COD orders add $5. Dealer inquiries invited. Orders generally shipped in 24-48 hours. No refunds or exchanges without prior authorization.



WE'RE BRINGING THE COCO

RAINBOW'S BROADENING ITS SPECTRUM

THE RAINBOW and the Delphi Information Utility have joined together to allow CoCo owners all over the world to connect with one another!

Delphi is a full-service information utility. It offers everything from up-to-the-minute news stories from The Associated Press to electronic mail services. But, *best of all*, it now has **a special forum for Color Computer owners, and it's operated by the people who bring you THE RAINBOW each month.**

The CoCo Special Interest Group (SIG) features a variety of services, including an open forum where you can send and receive messages from Color Computer owners all over the world. It also has several databases to which you can upload your favorite programs and from which you can download programs written by other CoCo enthusiasts. Some of these databases are BASIC programming, OS-9 and home applications.

When setting up your account with Delphi, if you do not have a credit card or prefer not to use it, Delphi requires that you send $25 to give your account a positive balance. This will be refunded after your first free hour if you choose to no longer use the system or it will be applied to future connect charges. If you do not maintain a positive balance, you will be charged $3.50 each month for direct billing.

PEEK INTO THE RAINBOW

The CoCo SIG's conference feature allows you to meet electronically with other members of the CoCo Community. You can join conferences with notables such as Dale Puckett, Cray Augsburg, Marty Goodman, Don Hutchison, Jim Reed, Lonnie Falk and others — on a regular basis. Conference schedules will appear in THE RAINBOW each month. Be sure to check online announcements for changes and additions.

THE OTHER SIDE OF THE RAINBOW

On Delphi, you also are able to buy RAINBOW ON TAPE — order a whole set, or download an individual program immediately. You can also renew your RAINBOW subscription, make a fast and easy order for software or hardware from a multitude of vendors, or inquire about products on the CoCo SIG.

We also have a number of **programs that you can download** and use, just for the cost of the time you spend transferring them. There'll also be **corrections for RAINBOW articles,** helpful hints and many other useful features.

FREE LIFETIME MEMBERSHIP

THE RAINBOW is offering subscribers a free lifetime subscription to Delphi — a $24.95 value — and a free hour of connect time — a $7.20 value at either 300, 1200 or 2400 Baud — so you can sample Delphi and the RAINBOW CoCo SIG. That's right. Your subscription to THE RAINBOW entitles you to this $32.15 value as a ***free bonus!***

If you're not a RAINBOW subscriber, just enter your order when you sign on with Delphi and you'll get the same great deal! For our $31 subscription fee, you'll get the finest Color Computer magazine ever, a free lifetime subscription to Delphi and a free hour of connect time.

SAVE EVEN MORE

Want to save even more? While you're online you can order, for only $29.95, a deluxe package which includes the Delphi membership, the *Delphi Handbook and Command Card* ($21.95) and a total of three hours of connect time ($21.60).

Delphi provides us all with **Immediate CoCo Community**. Check it out today. After all, you can sample it for free!

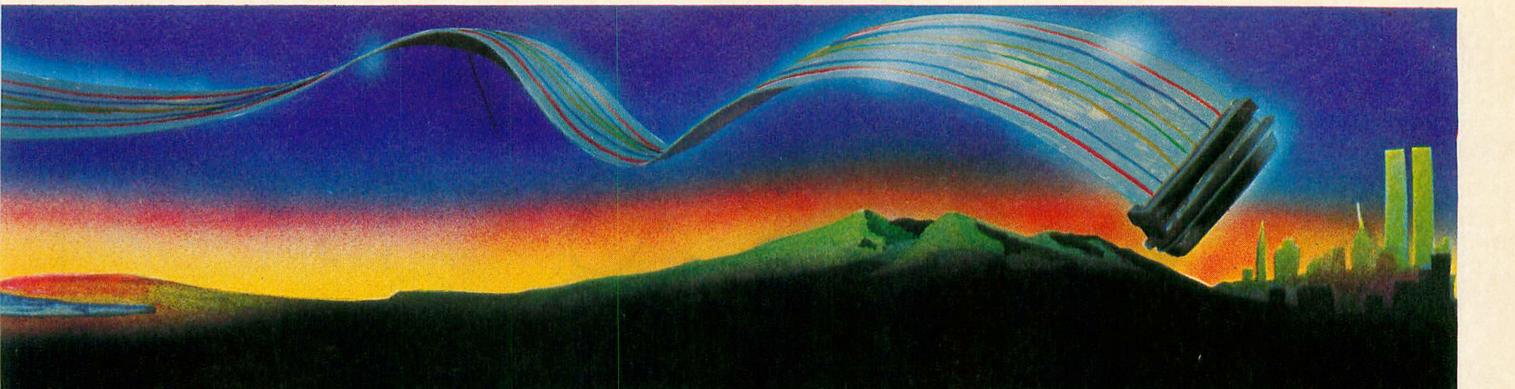
Problems? Call Delphi:

(800) 544-4005

(617) 491-3393

DELPHI TYPE:

GROUP COCO



COMMUNITY TOGETHER

How to reach RAINBOW's Color Computer SIG . . .

There are several ways to connect to Delphi and THE RAINBOW's CoCo SIG. In most cities you will not even have to pay long distance charges; you can use special data communications networks like Telenet, Tymnet and the Canadian Datapac network.

First, set your terminal program to operate at either 300 or 1200 Baud (depending on the modem you have), and also select either 7 bits with even parity or 8 bits with no parity, and one stop bit. (If one combination doesn't work, try another.)

Decide which network you should use. There is no surcharge for Telenet or Tymnet. Canadian residents using Datapac will be charged an additional $10.80 (U.S.) per hour.

On Telenet: Uninet network has merged with Telenet. To get the Telenet number for your area, call (800) 336-0437. After you call the local access number and make connection, press ENTER twice. When the "TERMINAL=" prompt appears, press ENTER again. When the "@" prompt appears, type `C DELPHI` and press ENTER.

On Tymnet: Call (800) 336-0149 to get the Tymnet number for your area. After you dial your designated number and connect, you will see either "garbage" or a message saying "please type your terminal identifier." At this point, even if the screen is garbled, simply press 'A'. When "please log in:" appears, type `DELPHI` and press ENTER.

From Canada (on Datapac): Call Delphi Customer Service at (617) 491-3393 to get the Datapac number for your area. After you connect, press the period key (.) and ENTER (use two periods if you're using 1200 Baud). Type `SET 2:1, 3:126` and press ENTER. Now type `p 1 3106, DELPHI;` and press ENTER. Delphi's new rates indicate an additional $10.80 hourly surcharge for evening use of Datapac, which means a total of $18 (U.S.) for connect time.

From other countries: Many countries have their own data networks that can connect to either Telenet or Tymnet. Check with the telephone authorities in your country for details on how to sign up for this service. When you have an account set up, you can reach Delphi with a "host code" of 3110 6170 3088 through Telenet, or 3106 90 6015 through Tymnet. (You'll have to pay the toll charges for this connection.)

Type in Your Username

If you're already a subscriber to THE RAINBOW, at the "USERNAME:" prompt, type `JOINDELPHI` and press ENTER. At the "PASSWORD:" prompt, type `RAINBOW`. Then, at the "NUMBER:" prompt, type your individual subscription number from the mailing label of your latest issue of THE RAINBOW. (If there are one or more zeros at the beginning of this number, include them.)

If you don't already have a subscription, at the "USERNAME:" prompt, type `JOINDELPHI` and press ENTER. At the "PASSWORD:" prompt, type `SENDRAINBOW` and press ENTER. Have your MasterCard, VISA or American Express card ready, because you'll be led through a series of questions that will enable us to put your RAINBOW and Delphi subscriptions into effect. In an effort to hold down non-editorial costs, we do not bill for subscriptions.

If you make a typing error, just use Control-X and start over. Remember that at any point, when you're on Delphi, you can type `HELP` to get help on how to use the system. To get off the system just type `BYE`.

If you find that you're unable to log on to Delphi and enter the CoCo SIG after following these instructions, call us during afternoon business hours at (502) 228-4492. We'll be glad to offer assistance.

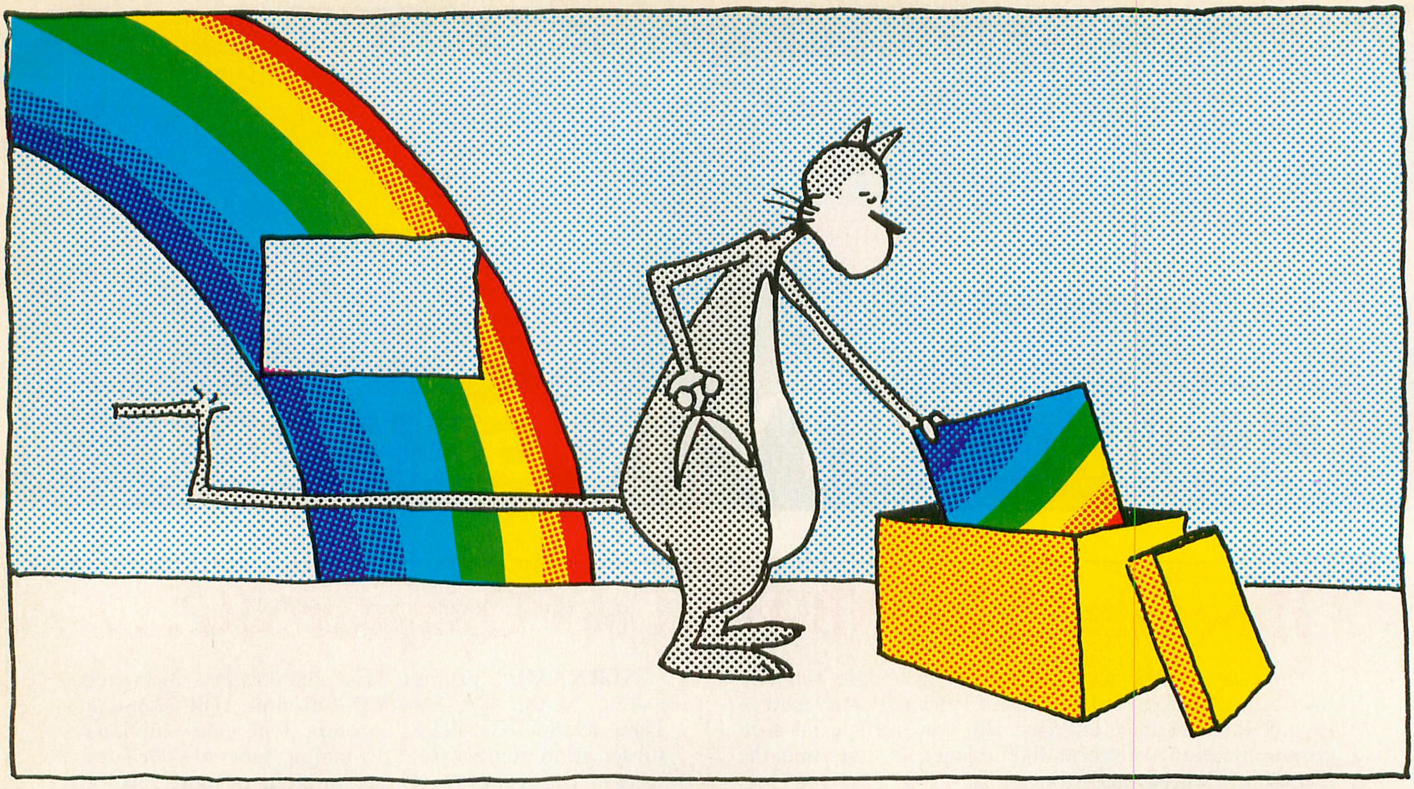
Come Visit Us! Type: `GROUP COCO`

After you sign in, you'll be prompted to set up your own, personal "user name" — Delphi is a friendly service, no numbers to remember — and you'll be asked a number of questions so Delphi can set up your account. You'll also be assigned a temporary password.

Delphi will tell you that your account will be ready after 6 p.m. the same day if you sign up before noon (Eastern time zone.) If not, your account will be ready at 6 p.m. the next day. Once an account is verified and opened, *each RAINBOW subscriber will be credited with an hour of free time!*

When you log back in, use your chosen username and your temporary password to access the system. At that point, you will meet Max, who will help you configure things and will change your temporary password into your own *personal* password. This is the password you will use for subsequent sessions — or until you change it.

After Max bids you goodbye, you'll wind up at the Delphi Main Menu; type in `GROUP COCO` and **join us on the CoCo SIG!**



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Subscriptions to THE RAINBOW are $31 in the United States; U.S. $38 in Canada. The surface rate to other countries is U.S. $68; the air rate, U.S. $103. Kentucky residents add 5% sales tax. **U.S. currency *only*, please.** All subscriptions begin with the current issue. Please allow 6 to 8 weeks for delivery. In order to hold down non-editorial costs, we do not bill.

```
78 IFA$="P"ANDLU>0ORA$="p"ANDLU>
0THENC$="Output to Printer":GOSU
B96:INPUT"What is your printer's
 width";C:C=INT(C):IFC<1THEN79EL
SEGOSUB112:GOTO105
79 PLAYE$:GOTO59
80 NC=0:PS=S:FORQ=S TO S+(250*LU
)-250STEP250
81 LN$="":FORQQ=Q TO Q+LL((Q-S)/
250)-1:LN$=LN$+CHR$(LPEEK(QQ)):N
EXT:P=1:LC=0
82 IR=INSTR(P,LN$,T$):IFIR=0THEN
84
83 LC=LC+1:LT$=LEFT$(LN$,IR-1):R
T$=MID$(LN$,IR+LEN(T$),250):IFLE
N(LT$)+LEN(R$)+LEN(RT$)>250THENP
S=PS+250:LC=0:GOTO87ELSELN$=LT$+
R$+RT$:P=IR+LEN(R$):GOTO82
84 LL((Q-S)/250)=LEN(LN$):IFLEN(
LN$)=250THEN86
85 LN$=LN$+STRING$(250-LEN(LN$),
0)
86 FORZZ=1TO250:LPOKEPS,ASC(MID$
(LN$,ZZ,1)):PS=PS+1:NEXT
87 NC=NC+LC:NEXT
88 PRINT"Number of occurrences c
hanged:"NC:GOSUB114:GOTO104
89 HSTATQ$,XQ,MX,MY:CP=1:GOSUB10
8:PRINT"Line"LN"found.":LN$="":F
ORQQ=Q TO Q+LL((Q-S)/250)-1:LN$=
LN$+CHR$(LPEEK(QQ)):NEXT:LOCATE0
,3:ATTR0,0:PRINTSTRING$(7,13):LO
CATE0,3:PRINTLN$
90 LOCATEMX,MY:ATTR0,4:PRINTSTRI
NG$(7,13):LOCATEMX,MY:LINEINPUT"
Target text: ";T$:LOCATEMX,MY:PR
INTSTRING$(7,13):LOCATEMX,MY:LIN
EINPUT"Replacement: ";R$:P=1
91 IR=INSTR(P,LN$,T$):IFIR=0THEN
93
92 LT$=LEFT$(LN$,IR-1):RT$=MID$(
LN$,IR+LEN(T$),250):IFLEN(LT$)+L
EN(R$)+LEN(RT$)>250THEN93ELSELN$
=LT$+R$+RT$:P=IR+LEN(R$):GOTO91
93 LL((Q-S)/250)=LEN(LN$):IFLEN(
LN$)=250THEN95
94 LN$=LN$+STRING$(250-LEN(LN$),
0)
95 FORZZ=1TO250:LPOKEQ,ASC(MID$(
LN$,ZZ,1)):Q=Q+1:NEXT:GOSUB114:G
OTO104
96 LOCATE(W-LEN(C$))/2,12:PRINTC
$:PRINT:RETURN
97 FORQ=S TO S+(250*LU)-250STEP2
50
98 L$="":FORQQ=Q TO Q+LL((Q-S)/2
50)-1:L$=L$+CHR$(LPEEK(QQ)):NEXT
:IFLEN(L$)=250THEN99ELSEL$=L$+ST
RING$(250-LL((Q-S)/250),0)
99 IR=INSTR(1,L$,T$):IFIR=0THEN1
03
100 ATTR0,0:LOCATE0,3:PRINTSTRIN
G$(7,13):LOCATE0,3:PRINTL$:ATTR0
,4:LOCATE(W-30)/2,22:PRINT"Do yo
u want to continue? (Y/N)";
101 A$=INKEY$:IFA$=""THEN101ELSE
IFA$="Y"ORA$="y"THEN103
102 ED=1:EL=LL((Q-S)/249):PT=Q:G
OTO104
103 NEXT:ATTR0,0:GOTO16
104 POKE&HFFD9,0:CLOSE#-1:GOSUB1
47:CLS1:ATTR0,0:LP=1:X=0:Y=3:WID
THW:GOSUB54:LOCATEX,Y:PRINTL$:GO
TO18
105 LOCATE0,11:ATTR0,0:PRINTSTRI
NG$(12,13);:GOTO18
106 INPUT"Start, increment";SR,I
```

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$ $ $ $ $ $ $ $ $ $ $ $ $ $

```
C:SR=INT(SR):IC=INT(IC)
107 IFSR+IC*L>63999THENPLAYE$:GO
TO106ELSE16
108 NB$="":INPUT"What is the lin
e number";LN:LN=INT(LN):LN$=STR$
(LN):LN$=RIGHT$(LN$,LEN(LN$)-1)+
" "
109 FORQ=S TO S+(250*LU)STEP250:
FORQQ=Q TO Q+LEN(LN$)-1:NB$=NB$+
CHR$(LPEEK(QQ)):NEXT:IFLN$=NB$ T
HEN111ELSENB$="":NEXT
110 ED=0:CP=0:PRINT"Line"LN"does
 not exist.":GOSUB114:GOTO105
111 IFCP=1THENCP=0:RETURNELSEED=
1:LX=(Q-S)/249:EL=LL(LX):PRINT"L
ine"LN"found.":PT=Q:L$="":FORQQ=
Q TO Q+249:L$=L$+CHR$(LPEEK(QQ))
:NEXT:GOTO104
112 POKE&HFFD8,0:PRINT#-2:FORQ=S
 TO PT-1:IFLPEEK(Q)=0THEN113ELSE
PRINT#-2,CHR$(LPEEK(Q));:IFPOS(-
2)=C THENPRINT#-2
113 NEXT:POKE&HFFD9,0:RETURN
114 LOCATE(W-26)/2,22:PRINT"Pres
s any key to continue.";
115 IFINKEY$=""THEN115ELSERETURN
116 LOCATE(W-20)/2,22:PRINT"Are
you sure? (Y/N)";
117 IFINKEY$="Y"ORINKEY$="y"THEN
RETURNELSEIFINKEY$="N"ORINKEY$="
n"THEN105ELSE117
118 LINEINPUT"What is the filena
me? ";F$:POKE&HFFD8,0:F$=LEFT$(F
$,8):IFDV=1THENF$=F$+".BAS"
119 OPEN"O",#DV,F$:ATTR0,0:WIDTH
W:PRINT"File being saved: "F$:FO
RQ=S TO S+(250*LU)-250STEP250:LN
$="":FORQQ=Q TO Q+LL((Q-S)/250):
LN$=LN$+CHR$(LPEEK(QQ)):NEXT:PRI
NTLN$;:PRINT#DV,LN$:NEXT:GOSUB14
7:CLOSE#-1:POKE&HFFD9,0:RETURN
120 LINEINPUT"What is the filena
me? ";F$:POKE&HFFD8,0:F$=LEFT$(F
$,8):IFDV=1THENF$=F$+".BAS"
121 FORQ=0TO LU:LL(Q)=0:NEXT:PT=
S:OPEN"I",#DV,F$:ATTR0,0:WIDTHW:
PRINT"File loading: ";F$
122 POKE&HFFD8,0:IFEOF(DV)=-1THE
N127ELSELINEINPUT#DV,LN$:POKE&HF
FD9,0
123 IFLN$=""THEN122
124 LN$=LN$+CHR$(13):LL(XX)=LEN(
LN$):IFLEN(LN$)=250THEN125ELSELN
$=LN$+STRING$(250-LEN(LN$),0)
125 PRINTLN$;:FORQ=1TO250:LPOKEP
T,ASC(MID$(LN$,Q,1)):PT=PT+1:NEX
T
126 XX=XX+1:IFXX<L THENGOTO122EL
SEXX=XX-1:GOTO127
127 LU=XX:POKE&HFFD9,0:EL=LL(XX)
:RETURN
128 ATTR0,0:WIDTHW:ATTR0,0,U:PRI
NT:PRINT:LOCATE(W-11)/2,1:PRINT"
Cut & Paste":ATTR0,0:PL=1:X=0:Y=
3:LOCATEX,Y:PRINTLN$:ST=1:EN=EE:
LOCATE(W-30)/2,12:PRINT"Position
"PL"Start"ST"End"EN
129 EXEC44539:A$=INKEY$
130 IFA$=CHR$(8)THENPL=PL-1:IFPL
<1THENPL=1:PLAYE$:GOTO129ELSEX=X
-1:IFX<0THENX=W-1:Y=Y-1:GOTO142E
LSE142
131 IFA$=CHR$(9)THENPL=PL+1:IFPL
>EE THENPL=EE:PLAYE$:GOTO129ELSE
IFPL=251THENPL=250:PLAYE$:GOTO12
9ELSEX=X+1:IFX>W-1 THENX=0:Y=Y+1
:GOTO142ELSE142
132 IFA$=CHR$(10)THENPL=PL+W:IFP
L>EE THENPL=PL-W:PLAYE$:GOTO129E
LSEIFPL=251THENPL=250:PLAYE$:GOT
O129ELSEY=Y+1:IFY>24THENY=24:GOT
O142ELSE142
133 IFA$=CHR$(94)THENPL=PL-W:IFP
L<0THENPL=PL+W:PLAYE$:GOTO129ELS
EY=Y-1:IFY<0THENY=0:GOTO142ELSE1
42
134 IFA$="S"ANDPL<EN ORA$="s"AND
PL<EN THENPLAY"L25O3C":ST=PL
135 IFA$="E"ANDPL>ST ORA$="e"AND
PL>ST THENPLAY"L25O3C":EN=PL
136 IFA$="M"ANDPL>=EN ORA$="M"AN
DPL<ST ORA$="m"ANDPL>=EN ORA$="m
"ANDPL<ST THEN138
137 GOTO129
138 PLAY"L25O3C":MV$=MID$(LN$,ST
,EN-ST+1):IFPL>=EN THENLT$=LEFT$
(LN$,ST-1):MD$=MID$(LN$,EN+1,PL-
EN):RT$=MID$(LN$,PL+1,EE-EN):CL$
=LT$+MD$+MV$+RT$ ELSELT$=LEFT$(L
N$,PL):MD$=MID$(LN$,PL+1,ST-PL-1
):RT$=MID$(LN$,EN+1,EE-EN):CL$=L
T$+MV$+MD$+RT$
139 LOCATE0,3:PRINTCL$:LOCATE0,1
2:PRINT:LOCATE(W-14)/2,12:PRINT"
Like so? (Y/N)":EXEC44539:A$=INK
EY$:IFA$="Y"ORA$="y"THENLN$=CL$
ELSEA$="":LOCATE0,12:PRINT:LOCAT
E0,3:PRINTLN$:GOTO142
140 LN$=LN$+CHR$(13):IFLEN(LN$)=
250THEN141ELSELN$=LN$+STRING$(25
0-EE,0):LN$=LEFT$(LN$,250)
141 AZ=Q:FORQQ=1TO250:LPOKEAZ,AS
C(MID$(LN$,QQ,1)):AZ=AZ+1:NEXT:G
OTO104
142 LOCATE(W-30)/2,12:PRINT"Posi
tion"PL"Start"ST"End"EN:LOCATEX,
Y:PLAYP$:IFPEEK(343)=247THEN130
143 IFPEEK(344)=247THEN131
144 IFPEEK(342)=247THEN132
145 IFPEEK(341)=247THEN133
146 GOTO129
147 IFPEEK(188)=14THENCLOSE#1:RE
TURNELSERETURN
```

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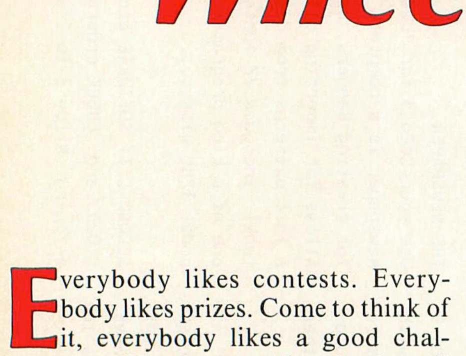
Contest Announcement

Brush up your programming creativity and show us the result!

Set Your *Wheels to Spinning*

By Bill Bernico

Everybody likes contests. Everybody likes prizes. Come to think of it, everybody likes a good challenge, too. Here's something that has all three. It's a programming contest where you, the readers, get a chance to finish a BASIC program I've started. There is no right or wrong way to complete my "core program." Each contestant may have a different idea of what this program should eventually do. Maybe your idea will win you a prize, so give it a try!



So far, here's what the program does. Three squares appear on the Hi-Res graphics screen. Each of those squares has a dial within it, numbered from one to eight. As you run the program, the pointer on the first dial starts spinning. To stop that first dial on a random number, press 1. Once you do, the first digit of a three-digit number appears and Dial 2 starts spinning. To stop that dial on a random number, press 2; the second digit will appear below. Last, the third dial begins spinning. Press 3 to stop it, and the third digit of that three-digit number is displayed. The screen holds in this position until you press the space bar, starting the procedure all over again.

Bill Bernico is the author of over 200 Color Computer programs and is a frequent RAINBOW contributor whose hobbies include golf, writing music and programming. Bill is a drummer in a rock band and lives in Sheboygan, Wisconsin.

That's all there is to it. Run it a few times and picture in your mind what you think the finished program should do. Maybe you have a Simulation in mind. Maybe you see it as some sort of utility. Or perhaps your finished program will be an educational learning tool, or even a game of chance. Submit anything. What you might think is not so great, I might feel is a winner.

Contest Rules

1. Programming is restricted to BASIC, including pokes or anything that can be typed in directly from the keyboard without help from other programs.
2. All entries must be submitted on either tape or disk. Include several saves and a brief explanation of how your entry works and what it does.
3. All entries must be based on the "core" provided here. That is, I want to at least see three spinning dials in the finished program. From there you're on your own.
4. Contest deadline is October 1, 1988, so get your entries in before then. The winning program will be published in a future issue of THE RAINBOW.
5. All entries become the property of Falsoft, Inc., publisher of THE RAINBOW.

Contest Prizes

First prize is a year's subscription (or extension) to THE RAINBOW *and* a year's subscription (or extension) to either RAINBOW ON TAPE or RAINBOW ON DISK.

Second prize is a year's subscription to THE RAINBOW.

Third prize is *Special Pack*, a collection of approximately 150 of my best programs..

Fourth through 10th prize winners will receive a package containing 25 of my best programs.

I'll be judging *all* entries, looking for that special talent from someone who may want to eventually co-author future programs with me. It could really be fun, so get your entries in now. Send all entries to:

THE RAINBOW Programming Contest
The Falsoft Building
9509 U.S. Hwy. 42
P.O. Box 385
Prospect, KY 40059

☐

The listing: CONTEST

```
10 'BASIC PROGRAMMING CONTEST
20 'by Bill Bernico
30 'AND (YOUR NAME HERE)
40 '
50 CLEAR1000:DIM A(12,12)
60 D$="BM=H;,=V;":X$="BM=X;,=Y;
70 N1$="BR3R2U6NGD6R2":N2$="BR3B
U5ER2FDGL2GD2R4":N3$="BR3BU5ER2F
DGNLFDGL2NH":N4$="BR6U6G3R4":N5$
="BR3BUFR2EU2HL3U2R4":N6$="BR3BU
3R3FDGL2HU4ER2":N7$="BR3BU6R4DG3
D2":N8$="BR4HUER2EUHL2GDFR2FDGNL
2"
80 PMODE4,1:PCLS1:SCREEN1,1:COLO
R0,1
90 DRAW"BM8,0R80D73L80U73"
100 CIRCLE(48,36),25
110 DRAW"BM42,8"+N1$+"BM64,17"+N
2$+"BM74,39"+N3$+"BM65,59"+N4$+"
BM43,70"+N5$+"BM21,59"+N6$+"BM12
,39"+N7$+"BM22,18"+N8$
120 GET(8,0)-(88,73),A
130 PUT(88,0)-(168,73),A:PUT(168
,0)-(248,73),A
140 DRAW"BM8,0R240D191L240U191
150 RI$=D$+"R20NH2G2":LE$=D$+"L2
0NE2F2":UP$=D$+"U20NG2F2":DO$=D$
+"D20NH2E2":UR$=D$+"E14NL3D3":LR
$=D$+"F14NU3L3":LL$=D$+"G14NR3U3
":UL$=D$+"H14NR3D3
160 H=48:V=36:GOSUB 270
170 IF INKEY$<>"1"THEN 160
180 X=110:Y=90:GOSUB 360
190 H=128:V=36:GOSUB 270
200 IF INKEY$<>"2"THEN 190
210 X=120:Y=90:GOSUB 360
220 H=208:V=36:GOSUB 270
230 IF INKEY$<>"3"THEN 220
240 X=130:Y=90:GOSUB 360
250 IF INKEY$<>CHR$(32)THEN 250
260 GOTO 80
270 DRAW"C0"+RI$+"C1"+RI$
280 DRAW"C0"+LR$+"C1"+LR$
290 DRAW"C0"+DO$+"C1"+DO$
300 DRAW"C0"+LL$+"C1"+LL$
310 DRAW"C0"+LE$+"C1"+LE$
320 DRAW"C0"+UL$+"C1"+UL$
330 DRAW"C0"+UP$+"C1"+UP$
340 DRAW"C0"+UR$+"C1"+UR$
350 RETURN
360 S=RND(8):ON S GOSUB370,380,3
90,400,410,420,430,440:RETURN
370 DRAW"C0"+RI$+X$+N3$:RETURN
380 DRAW"C0"+DO$+X$+N5$:RETURN
390 DRAW"C0"+LE$+X$+N7$:RETURN
400 DRAW"C0"+UP$+X$+N1$:RETURN
410 DRAW"C0"+UR$+X$+N2$:RETURN
420 DRAW"C0"+LR$+X$+N4$:RETURN
430 DRAW"C0"+LL$+X$+N6$:RETURN
440 DRAW"C0"+UL$+X$+N8$:RETURN
```

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A tutorial on creating CoCo comics, and the announcement of an ongoing cartoon-drawing contest

CARTOONING WITH COCO

By Logan Ward

Cartoons are drawings that depict everyday situations in a comical manner. They express ideas, inform us on current events, teach lessons and, most importantly, they entertain.

Everyone can identify with cartoons. They are a twist on everyday life. You see them taped to desks, stuck on refrigerators and pinned to bulletin boards. Cartoons are usually the first things people look for upon opening the paper or browsing through a magazine.

Some of the earliest cartoons date back to the mid-1700s. These cartoons depicted oppression and taxes, which were the main issues of the time. Ben Franklin and Paul Revere drew cartoons urging the colonists to revolt against England. But it wasn't until the mid-1800s that cartoons became a staple in magazines and newspapers.

Political cartoons did not become popular until the late 1800s. By the early 1900s, however, cartoons were a firmly entrenched piece of Americana.

Through the years, cartoons have been produced using a variety of tools. Pens, ink, pencils, erasers, charcoal, paint, rulers and drawing boards have been employed by cartoonists in creating their work. But now, with the advent of the personal computer, anyone can create cartoons digitally. Modern cartoon artists can now use a computer, mouse and printer as their tools.

Five Types of Funnies

Cartoons can be categorized into five general types; all varieties are distinctive, and each conveys a different type of story. First of all and probably most important is the comic strip, which appears mainly in newspapers and magazines. This type of cartoon is usually a standard feature, and you'll likely find several strips on one or more

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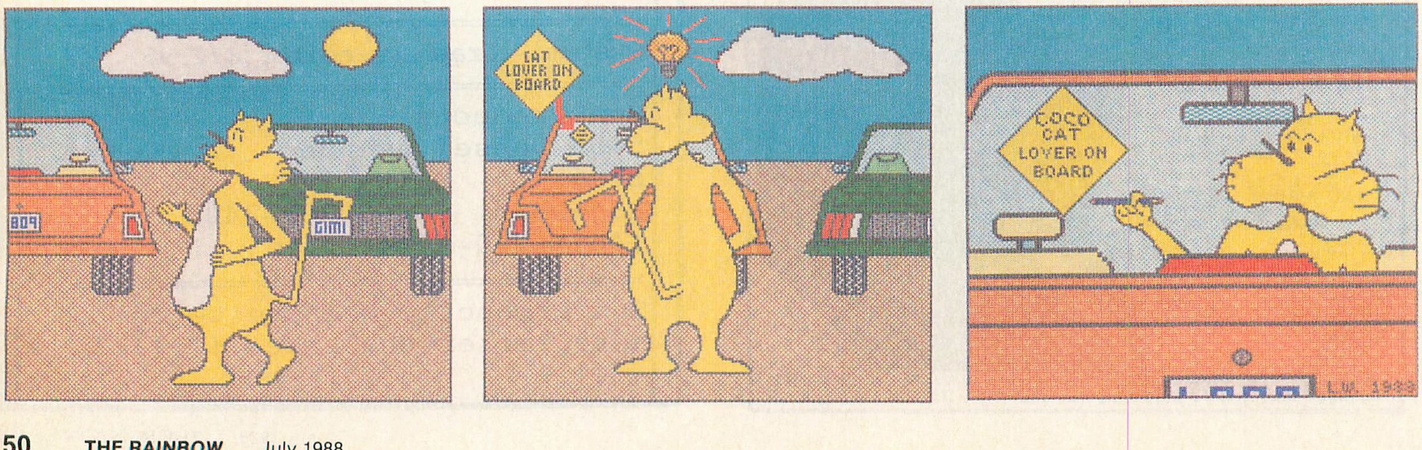
Logan Ward has been a CoCo nut since 1982 and enjoys creating all types of graphics on his Color Computer. His interests include baseball card collecting and following Nascar races. Logan creates the Maxwell Mouse and CoCo Cat cartoons for THE RAINBOW and is president of the Memphis Color Computer Users Group.



pages of a newspaper. These comic strips, such as "Peanuts" and "Blondie," contain a series of panels linked together to tell a story or achieve a humorous climax.

Another popular form of cartooning is called the gag cartoon. This consists of a single panel with a clever one-line caption. The gag cartoon is usually an instant transfer of humor. It can feature a continuing character or be diverse, showing different characters each time (think of Gary Larson's "The Far Side"). Gag cartoons poke fun at everyday life and create humorous situations out of everyday occurrences. This is a type of cartoon popular with magazines.

Editorial cartoons are another favorite brand of cartooning. Like the gag variety, the editorial cartoon is a single-panel cartoon that covers a multitude of subjects. However, it is a pictorial opinion conveyed by the artist to sway the reader's judgment. Editorial cartoons deal with current events or social issues and make fun of people in the spotlight.

Another visually humorous type of cartoon is the animated cartoon. This type of cartoon takes the longest time to create but is usually the most pleasing. Each animated cartoon starts as a sketch, which is later turned into a completed drawing and then painted. More drawings are made similar to the first, with the exception of a small change in placement of a hand, eye or other body part.

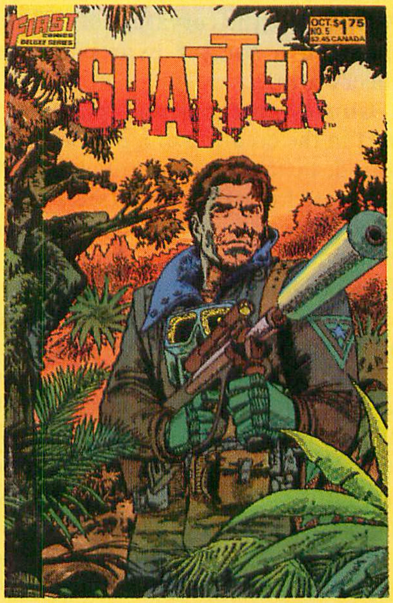
After several drawings are made, they are quickly shown in sequential order, taking on the illusion of movement. Background scenes are added later to complete the work. Animated cartoons can take from a couple of minutes to a couple of hours to tell their stories. Subject matter for this style of cartooning is very broad; material can range from the informative, such as safety guides for workers, to the humorous, showing Bugs Bunny making a fool of Daffy Duck.

Finally, there's illustrative cartooning. This type is found in advertisements, school books, promotional materials, etc. Most illustrative cartoons draw attention to or help tell the story of the idea they are promoting. Sometimes illustrative cartoons use famous comic strip and gag characters. For example, Garfield is currently used to promote libraries.

Attention, Cartoonists!

As you skim through the magazine each month, you've probably noticed "Mouse Tales," starring Maxwell Mouse. Logan Ward is the cartoonist responsible for Maxwell Mouse, and he sends us the cartoon every month in living color — thanks to his CGP-220. Starting with this issue, Logan will be responsible for bringing CoCo Cat back to the pages of THE RAINBOW.

We here at THE RAINBOW are pretty excited about the new graphics programs and their capabilities! Just imagine — with a little creativity, a printer and graphics programs that rival (and beat) the "big boys," CoCoists can unleash their creative potential! With word processing and desktop publishing programs, CoCoists routinely publish their own newsletters. Now with the enhanced graphics that programs like *Color Max Deluxe* and *CoCo Max III* allow, not only are cartoons like Logan's possible, but so are whole comic books! Add the implications of video digitizers, sound digitizers (like Gimmesoft's *Maxsound*) and laser printers, and the possibilities are mind-blowing!



SHATTER, from First Comics Inc.™, is drawn on the Macintosh.

Did you know that there are already commercial comic books drawn on computer? The computer is the Macintosh, not the CoCo, unfortunately, but we know anything a Mac can do. . . . SHATTER, from First Comics, Inc.™, was probably the first comic drawn on computer. It's a science fiction portrayal of the world a few decades into the future, when the globe is divided into corporate, not political, states; having been enhanced with RNA transplants, animals are able to take over human tasks. The drawing's digitized look and the "computer" fonts used for dialogue and narration all contribute to the futuristic atmosphere. Even Marvel Comics is "going computer" with its *Iron Man* graphic novel.

What does this mean for CoCoists? Take a look at the pictures that fill the pages of "CoCo Gallery" — the quality of our graphics just screams for the CoCo to get into the act. Our machine can hold its own!

We are so enthused about what the CoCo can do, in fact, that we are planning an ongoing cartooning contest, something like the "CoCo Gallery." If you've had an idea for a CoCo cartoon gnawing at you, put it onscreen, print it out (you don't have to use a color printer) and send it in. If we like it, we'll publish it and pay you for your creative talents.

For a guide on what we're generally looking for, examine Logan's cartoons and follow the advice he gives in this article. But be creative — we're breaking new ground here! If you like to draw cartoons by hand and your subject is Color Computer related, we're interested in your work, too (check out Kelly Taylor's "Dr. Nibble" on Pages 116 and 120, this issue).

The best thing about this contest is that there is no deadline, and there's no limit to the number of cartoons you can submit. Just tell us what graphics program you used to create your cartoon and send us a printout and a disk copy of your cartoon panels. Include your name, address and phone number, and help us take CoCo applications to exciting new heights!

Coming Up with Ideas

Consistently developing good ideas is probably the hardest part of being a cartoonist. Whether you create cartoons on a daily basis or draw only one a month, you must be on the lookout for fresh ideas and new roads to travel. A cartoonist must have the ability to picture an entire cartoon in his mind and then transfer it to the computer or paper.

Cartoonists get their material in a variety of ways. Some observe gestures, others listen. Some lock themselves in their rooms, while others stare into space. Do not try to force ideas — let them come to you. Even a simple sound can trigger a great idea.

My ideas come when I'm not even thinking about cartoons. I can be washing the car or cutting the grass when I am struck with a good idea. However, my best ideas come right before I fall asleep, when I am kind of in the twilight

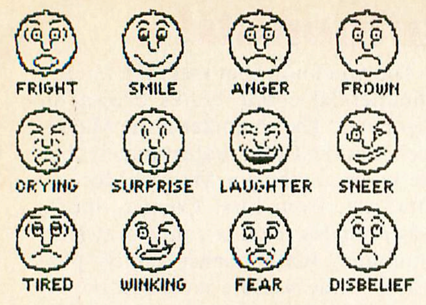


Figure 1

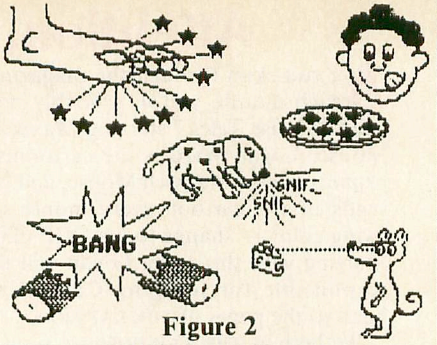


Figure 2

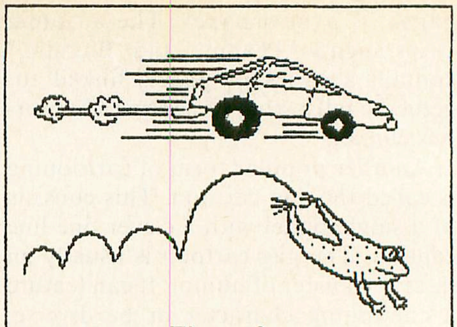


Figure 3

zone. I keep a note pad by my bed to write them down. If I don't record them when they are conceived, my ideas are forgotten by morning. Use whatever works for you to get ideas, but *do* write them down. It can be surprising what you'll find on a look back through your notebook.

What You'll Need

In order to create cartoons on your CoCo, you need several tools. First, of course, you need a CoCo with TV or monitor — any model will do fine. Second, you need a mouse. I do *not* recommend joysticks, as they lack the precision necessary to create detail in pictures and cartoons.

Most importantly, you need a good graphics editor. I recommend using *CoCo Max II*, *CoCo Max III* or *Color Max Deluxe*. These packages have the features needed to draw and manipulate cartoons on a CoCo (like flip, rotate, cut and paste). Lastly, you need a printer; however, this can be optional — but always nice to have if you want a hard copy to show friends. If you can find one, I suggest getting a CGP-220. It does a good job on a CoCo 1 or 2 and an unbelievable, eye-popping job on the CoCo 3. A cartoon printed out with this color printer looks like it belongs in the Sunday comics. If you have a CGP-220 and would like to use it with graphics drawing programs that don't support it, see the May '88 RAINBOW: Page 42, for Duane M. Perkins' *CoCo 3 Color Dump*, and Page 58, for Tracy L. Skaggs' *PMODE Polychrome* for CoCos 1 and 2. These programs dump CoCo graphics screens in color.

Tricks of the Trade

As with anything in life, you must be original to be successful. This holds true in cartooning. Developing original techniques and ideas is the key to being a popular cartoonist. Try not to copy or mimic someone's technique. Whether your style is serious or sarcastic, do what feels good to you. There is always an audience, and you will be a success.

In cartooning, things tend to be a little exaggerated. Large eyes, elongated noses, four fingers, swollen heads, silly hairstyles and big feet all seem to be the norm. The nicest aspect of cartooning is the freedom to draw anything in any way possible. There are no boundaries, and the ideas are limited only by your own imagination.

Facial expressions play an important role in how a drawing is interpreted. Almost any type of mood or feeling can be illustrated by the expression of the character's face (see Figure 1). A slight slant of the eyebrows can mean the difference between a frown and a sneer. A change in the curvature of the mouth can turn a somber expression into a cheery grin.

Conveying the senses plays a huge part in the creation of a cartoon. Smell, sound, taste, sight and touch can all be illustrated in cartooning (see Figure 2). Used properly, the senses can express your ideas better than words and add depth to your cartooning abilities.

Getting a character into the proper pose can be critical to your cartoon. For example, if your main character is talking to a support character, show him in front with the support character's back turned. This way everyone spots the center of attention, and your gag goes over immediately.

It is always best to envision your character's positions in your mind in order to create the appropriate setting. Try to think of the scene in terms of "camera angles," where you want the star to be the center of attention. Some scenes require close-ups; others take wide-angle shots. Some are action shots that require movement (see Figure 3). Remember, you are the producer and your computer is the camera. It is up to you to develop the perfect scene.

Getting the proper perspective goes hand-in-hand with posing. In real life, objects that are far away seem smaller than objects that are closer to us (see Figure 4). This holds true in cartooning, also. If your character is walking toward a door, for example, then naturally the door must be taller than the character. Creating the right depth greatly enhances the cartoon's attraction to the reader.

Creating a CoCo Cartoon

Once you have your cartoon clearly thought out, it's time to boot up your favorite graphics program and get to work. First, draw a box on the screen — this is what your cartoon will be drawn in. There are approximately 80 pixels per inch horizontally and 74 pixels per inch vertically in the regular print mode of *CoCo Max*. It is up to you to determine the size. I use a 254-by-182 pixel box to create my drawings. I recommend making the box only one line thick to draw no attention to it. Now save your box to a separate file so that you can use it for future cartoons.

After your box is complete, it's time to start drawing the cartoon. It is best to create your characters first. For the time being, keep all your sketches in black-and-white. I recommend using a one-pixel black paint brush. This works better than using the pencil icon because the pencil sometimes gets in the way of seeing where you want to draw, and it can also erase part of your drawing if you let off your mouse button and then click it again.

At this stage, it is best just to get a rough outline of your character. Draw several different variations and choose the one you like most. Once you have picked the pose you want to use, erase the others. Use Zoom or Fat Bits to clean up the picture and smooth out rough areas. It is easiest to do facial expressions and hand movements under Fat Bits.

As when drawing anything on the CoCo, it is best to make saves before you do a lot of editing. If you do something you don't like, you can always reload the drawing from an earlier stage.

When you are drawing front views of

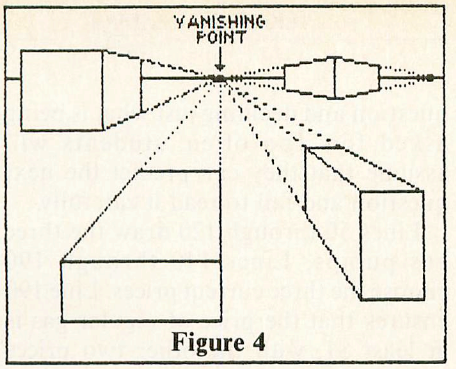


Figure 4

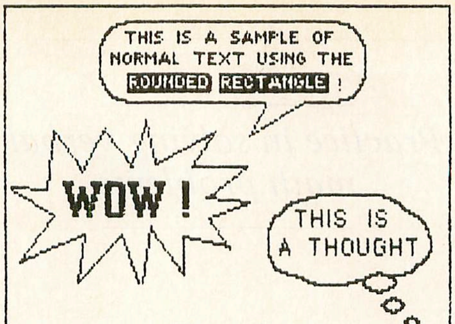

THIS IS A SAMPLE OF NORMAL TEXT USING THE ROUNDED RECTANGLE !
WOW !
THIS IS A THOUGHT

Figure 5

your character, you might find it easier to draw only half of the character and then use the editing box to make a copy. Use the Horizontal Flip feature on the copy to make a mirror image of it. Click out of the editing box, lasso the flipped copy and join it side-by-side to the original — you now have a complete character by doing half the work. This technique can be used for any symmetrical shape.

Once you finish drawing your character, use a formatted disk to save character clips. As you go along, save each pose of every character to your clip disk. Use the lasso icon to copy your characters. This way you can recall characters at any time and manipulate them for use in another scene.

When your collection of characters has grown large, take several formatted disks and make clip disks of hands, arms, bodies, legs, feet and heads. These can be copied from your character clip disk. You will then have the ability to mix and match body parts to create new characters — just like Dr. Frankenstein.

After your characters have been drawn, it's time to draw the background. First, draw the horizon. Use the rubber band line function to do this. If this line intersects your character, go ahead and let it go through the character. This will keep the horizon level on both sides of the pose. Remember, you can always paste the character back to the screen from the clip disk if you have to draw through it to create background objects.

Make your background relate to your gag. Keep background objects from interfering with your characters, and make sure the scene is proportional. When you are drawing buildings and houses, it is best to use rectangles and rubber band lines. Trees can be sketched with a single-pixel paintbrush, using jagged lines for branches. Clouds can be drawn with a one-pixel brush; they can also be created with a larger round brush, then circled with the Edit box using the Trace Edges function.

If you want to draw the sun, moon or planets, use the circle icon. A crescent moon can be drawn using two circles spaced 15 to 25 pixels apart, with the center point staying on the same horizon line. Erase unwanted curves once you have your circles in place. Stars are drawn using the one-pixel paintbrush.

Consecutive patterns like bricks, shingles or floor patterns can be created easily by using the Edit Pattern function. Be sure to make these patterns simple so they won't distract from your character and gag. As with drawing characters, you can create symmetrical objects by drawing only half of an object, then copying and flipping it to match the other side. As always, use the Zoom function to clean up background objects and get a clear, crisp scene.

> ***"Developing original techniques and ideas is the key to being a popular cartoonist."***

Although some cartoon gags can be expressed without words, most require some type of dialogue. When you are adding text to your cartoon, it is best to create a balloon or dialogue box outside the cartoon itself and then incorporate it later.

To create your balloon, you must first decide what text font you want to use. I recommend using a small font for normal text situations. If you want to emphasize a particular word, use a bold or shadow style on it. For one-word expressions like "Boing," "BANG!" or "Wow," use a large text font with any style you prefer. Bring in the lasso to manipulate and center the text. After you have positioned the text, put the balloon border around it. There are several ways to accomplish this: You can use the one-pixel paintbrush and draw a circle around the text, cleaning it up with Fat Bits; you can use a rounded rectangle to place a border around the text; or you can use a rubber band line to express text in a dynamic manner (see Figure 5).

Once the border is the way you want it, circle it with the lasso and cut it out. Position the cartoon in the window and paste the text balloon back onto the cartoon. At this point, you can position the balloon anywhere you want. Click to make your selection permanent. Next you must direct the text to the character that is speaking. Use the one-line brush or rubber band line to make the cone point to your character. Use Fat Bits to clean up. If a character is thinking instead of speaking, simply draw small circles going from the character to the balloon.

At this point, if you are doing a gag cartoon, you are finished. If you are doing a strip, repeat the process for every panel.

When you're finished with your cartoon, you will want to print it out. If you are using a dot matrix printer, I recommend using double-strike if possible: This will give your printed cartoon that professional look. You can print in any size you like, but the smaller the printout, the more detailed the drawing looks.

If you are fortunate enough to have a CGP-220, you can print out a color version of your cartoon. In my opinion, this is the only way to print cartoons. Personally, I prefer to create my cartoons on my CoCo 2 in black-and-white and then transfer them to the CoCo 3 for coloring. This way, I have the cartoon available on both Color Computers, which gives me the ability to print it out in any style using any printer.

CoCo cartooning is an entertaining and creative aspect of graphics application on the Color Computer. No particular style is required, and any CoCo user can get involved with this newest aspect of computer graphics. All it takes is a little imagination and original thought to produce wonderful cartoons just like the pros.

(Questions or comments regarding this tutorial may be directed to the author at 2774 Lakeside Drive, Memphis, TN 38134. Please enclose an SASE when writing for a reply.)

Practice in solving verbal math problems

Motor Math

By Steve Blyn
Rainbow Contributing Editor

This month's article presents one example of the many verbal math problems that middle and upper division school children study. Verbal problems contain a short written story that the student must interpret before the math computation can be done. Verbal problems come in many types: Motion, interest and measurement problems are just a few. This month's program concerns computing the cost of various amounts of three grades of gasoline.

This topic can lead to learning in subject areas other than math. Students in social studies, for example, may be interested in tracing the cost of gasoline over the past 15 years. The oil crisis of the '70s made the public acutely aware for the first time of its vulnerability to the price of this commodity. I can vividly remember the high prices and especially the long lines at gas stations in those times. Children might enjoy learning about the reasons for the gas crisis and the likelihood of its return.

Almost every student has access to and is familiar with the family car. Several science lessons can be given on the topic of what makes the cars go. An explanation of gasoline grades — regular, premium, leaded and unleaded — should be given to the student before beginning this program, although I often find that many children know as much as adults do about types and brands of cars and gasolines.

Our program has an illustration of three gas pumps, which contain regular, no-lead and premium gas, respectively. A price for each appears under each pump. The prices appear randomly from example to example, always in ascending order with the premium gas priced highest. These prices, while not always totally realistic, tend to offer a fairly wide variety in practicing the particular math computation needed to solve these problems.

The prices will always be in integers such as $1.24. To put this program on a level for older students, you may readjust the gas prices to fractional or decimal values as they usually occur in reality. In this case, be sure to tell the students to round off to the nearest whole cent.

The student is asked to compute the price of a certain number of gallons of one of the three types of gasoline. The student must be careful to read the question and select the type of gasoline that the question refers to. This is a skill in and of itself — carefully reading the question and deciding just what is being asked for. Too often, students will assume that they can predict the next question and fail to read it carefully.

Lines 50 through 120 draw the three gas pumps. Lines 140 through 190 choose the three current prices. Line 190 ensures that the price of regular gas is at least $1, with the other two prices always somewhat higher. Line 210 selects the number of gallons currently purchased, represented by variable Q. Line 220 selects the type of gas currently purchased, represented by variable R. The true price is therefore Q times either A, B or C, depending on whether variable R chooses 1, 2 or 3.

Lines 260 through 290 ask for and evaluate the student's answer. The student is informed whether the answer was correct. If incorrect, the correct answer is displayed. When the ENTER key is pressed, the next example is displayed. After 10 examples, the student receives a scorecard. The student may then press B to begin again or E to end the program.

As always, we at Computer Island hope that your child or students enjoy and learn from this program. ☐

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.

The listing: GASQUIZ

```
10 REM"BUYING GASOLINE"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,STATEN ISLAND,NY,1988"
30 CLS0
40 REM"DRAW THE THREE GAS PUMPS"
50 PRINT@35,"REG.";:PRINT@44," N
O ";:PRINT@53,"PREM";
60 PRINT@67,"----";:PRINT@76,"LE
AD";:PRINT@85,"----";
70 FOR X=6 TO 13:FOR Y=6 TO 14:S
ET(X,Y,4):NEXT Y,X
80 FOR X=24 TO 31:FOR Y=6 TO 14:
SET(X,Y,3):NEXT Y,X
90 FOR X=42 TO 49:FOR Y=6 TO 14:
SET(X,Y,2):NEXT Y,X
100 FOR Y=4 TO 12:SET(14,Y,5):SE
T(32,Y,5):SET(50,Y,5):NEXT Y
110 SET(15,13,5):SET(33,13,5):SE
T(51,13,5)
120 FOR T=1344 TO 1535:POKET,143
:NEXT T
130 REM"CHOOSE THE CURRENT PRICE
S"
```

```
140 J=J+1
150 A=RND(100)+50:B=A+RND(20):C=
B+RND(20)
160 A=A/100:B=B/100:C=C/100
170 PRINT@320,"":PRINT@352,"":PR
INT@416,"":PRINT@448,""
180 IF J>10 THEN 340
190 IF A<1 THEN 150
200 PRINT@259,USING"#.##";A;:PRI
NT@268,USING"#.##";B;:PRINT@277,
USING"#.##";C;
210 Q=RND(7)+2:REM"THE # OF GALL
ONS"
220 R=RND(3):IF R=1 THEN N=A:A$=
"REGULAR"
230 IF R=2 THEN N=B:A$="NO LEAD"
240 IF R=3 THEN N=C:A$="PREMIUM"
250 AN=N*Q
260 PRINT@320,"WHAT IS THE PRICE
 OF"Q"GALLONS  OF "A$" GAS TODAY
? $";
270 LINEINPUT W$:W=VAL(W$)
280 IF INT(W*100+.05)=INT(AN*100
+.05) THEN PRINT@426,"CORRECT":R
R=RR+1:PLAY"A":GOTO 300
290 PRINT@418,"SORRY,THE ANSWER
IS $";AN
300 PRINT@453,"PRESS ENTER TO GO
 ON";
310 EN$=INKEY$
320 IF EN$=CHR$(13) THEN 130 ELS
E 310
330 GOTO 330
340 PRINT@326,"THIS SET IS OVER.
"
350 PRINT@357,"YOUR SCORE WAS"RR
*10;"%"
360 PRINT@448,"PRESS 'B' TO BEGI
N OR 'E' TO END";
370 EN$=INKEY$
380 IF EN$="B" THEN RUN ELSE IF
EN$="E" THEN CLS:END
390 GOTO 370
```

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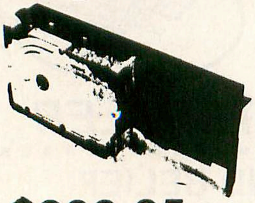

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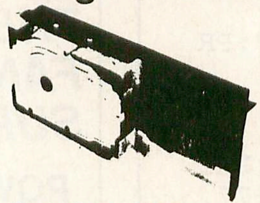

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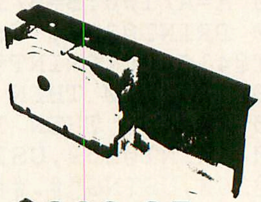

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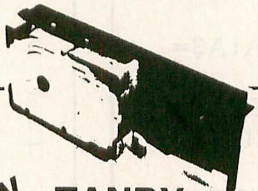

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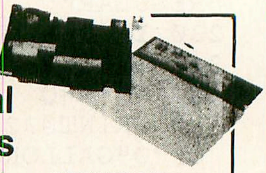

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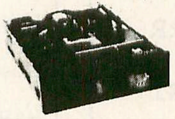

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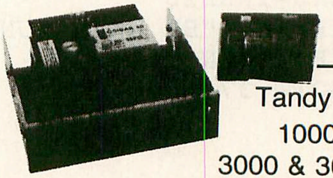

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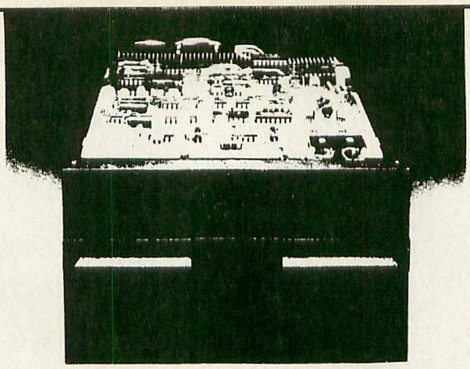

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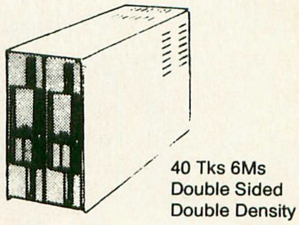

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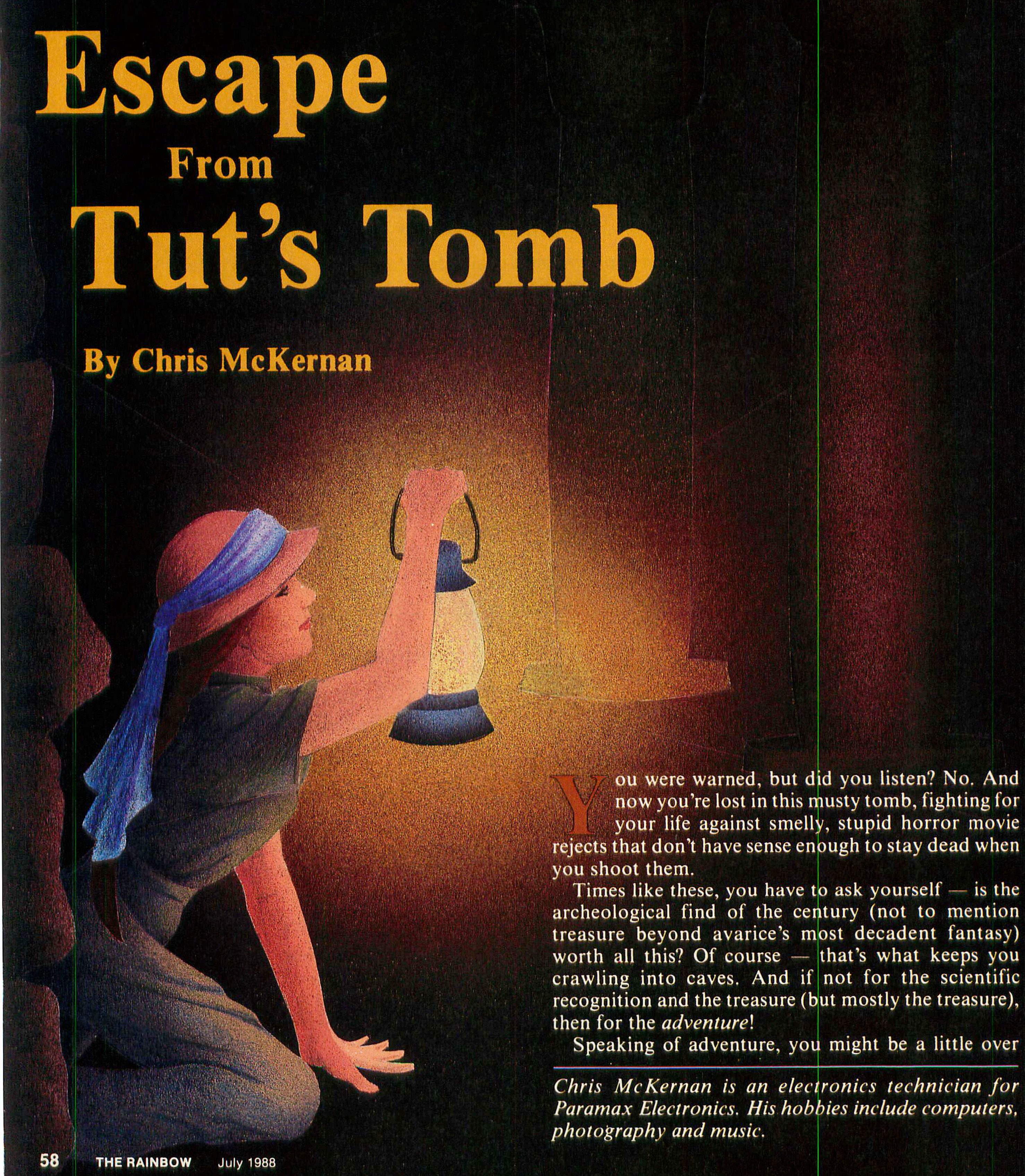
An action-packed arcade game written in machine language

Escape
From
Tut's Tomb

By Chris McKernan



You were warned, but did you listen? No. And now you're lost in this musty tomb, fighting for your life against smelly, stupid horror movie rejects that don't have sense enough to stay dead when you shoot them.

Times like these, you have to ask yourself — is the archeological find of the century (not to mention treasure beyond avarice's most decadent fantasy) worth all this? Of course — that's what keeps you crawling into caves. And if not for the scientific recognition and the treasure (but mostly the treasure), then for the *adventure*!

Speaking of adventure, you might be a little over

Chris McKernan is an electronics technician for Paramax Electronics. His hobbies include computers, photography and music.

your head in it this time. Crawling into *this* hole in the ground got you lost in these dark catacombs. Realizing that you have stumbled across the elusive tomb of King Tut is little comfort, at least not as long as those uglies keep trying to kill you. Your feeble musket fire is just barely able to hold them off. Every time you manage to grab some treasure and escape from one room into what must surely be a safe place to stop, relax and count your riches, more of those horrible beasts begin chasing you all over again! It's almost enough to make you give up exploring . . . Naw!

Tut's Tomb is a machine language arcade game comprised of three separate parts, each of which contains five mazes. Four BASIC programs make up the machine language program of Part 1, `TUT1`; two BASIC programs make up the machine language program of Part 2, `TUT2`; and two BASIC programs make up the machine language program of Part 3, `TUT3`.

Due to space limitations, only the BASIC listings that generate the machine language program of Part 1, `TUT1`, are presented this month. `TUT2` and `TUT3` cannot be loaded or run until you complete the fifth maze of `TUT1`. [You may need more than a month to get through the first five mazes of *Tut's Tomb*!] Onscreen loading instructions for Part 2 are presented at this time, along with a clue for solving the final maze of Part 3. The computer will appear to lock up. Simply press RESET and load the next part according to the instructions. The BASIC listings that create Part 2 and Part 3 will appear next month.

Use the following procedure to create Part 1 of *Tut's Tomb*:

1) Enter `POKE 113,0` and reset the computer to do a cold start;
2) Type in listings 1 through 4 and save them to tape or disk using the filenames `ONE`, `TWO`, `THREE` and `FOUR`, respectively;
3) Load and run each BASIC program in order;
4) At the final `OK` prompt, save the machine language program, `TUT1`, to tape or disk (tape users type `CSAVEM`) using the following command: `(C)SAVEM"TUT1", 20479, 26405,26405`.

To move the machine language program, `TUT1`, to its proper memory location, follow these steps:

1) Enter `POKE113,0` and reset the computer to do a cold start;
2) Enter `(C)LOADM"TUT1",49152` (tape users type `CLOADM`);
3) Resave the file by entering `(C)SAVEM"TUT1",4095, 10021, 10011`;
4) Enter `EXEC10011`.

In the future, if you followed Step 3 above, you need only load the file and enter `EXEC`.

Game Play

Use the right joystick to move the explorer up, down, left and right. Press the firebutton on the joystick to begin each level of play. To shoot the musket, press the firebutton while pointing the joystick in the desired direction (it will only fire right and left).

There are five types of creatures that will menace you, and you can score a variable amount of points by killing them:

Creature	Points
Scorpion-tailed bats	10
Blue serpents	20
Giant spiders	40
Disembodied dragon heads	60
Curses	80

Also, there are five types of treasure with variable point values:

Treasure	Points
Diamond rings	1,000
Priceless vases	2,000
Jewel boxes	3,000
Red sapphire pots	4,000
Gold crown	5,000

To exit a maze you must first obtain the key contained in that maze. To get a key, all you have to do is move up beside it. The key will disappear and be displayed at the top of the screen (under your score). You may then exit by going to the end of the maze, avoiding or killing the creatures along the way. Note that your feet must be touching the ground in order to exit.

Hints

- You can kill the creatures only by shooting them in the upper part of their bodies.
- Every time a creature is killed near its lair (the hole in the wall surrounded by red bricks), a new one appears in its place. New creatures either duplicate or exit the lair, so don't stand near it while shooting.
- Creatures are not always fatal when touched. In some cases, they can be bounced off the explorer's head.
- After completing the five mazes presented in Part 1, a clue is given describing how to escape the last maze of Part 3, `TUT3`.
- In some of the mazes, the explorer has the ability to fire through bricks (one of the handy bugs I purposely left in the program).

(Questions or comments regarding this program may be directed to the author at 2369 Madison #9, Montreal, Quebec, Canada H4B 2T5. Please enclose an SASE when requesting a reply.) □

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Editor's Note: For your convenience, the machine language files for TUT2 *and* TUT3 *will be included on this month's* RAINBOW ON TAPE *and* DISK, *immediately following* TUT1. *The* BASIC *listings that make up these two machine language programs will be printed in next month's issue.*

```
140 ......149   1270 ......58
290 .......21   1410 .....125
510 ......128   1600 .....207
680 .......91   1760 .....161
890 ......214   END .....135
1060 .....103
```

Listing 1: ONE

```
5 CLEAR 1000,&H4FFE
10 REM %%%%%%%%%%%%%%%%%%%%%%%%%
       %%%     PART #1 TUT    %%%
       %%% RUN THEN LOAD   #2 %%%
       %%%%%%%%%%%%%%%%%%%%%%%%%
15 FOR X=20479 TO 21959:READ DT:
POKE X,DT:NEXT X
20 DATA 189,18,118,189,23,112,18
9,23
30 DATA 135,189,38,229,189,23,17
4,189
40 DATA 23,220,189,24,5,189,24,9
3
50 DATA 127,30,250,134,1,183,31,
54
60 DATA 183,31,55,134,240,183,31
,24
70 DATA 189,25,3,189,24,112,189,
25
80 DATA 200,189,27,14,189,27,90,
189
90 DATA 18,92,182,255,0,129,254,
39
100 DATA 4,129,126,38,245,189,37
,76
110 DATA 189,37,164,189,38,82,18
9,38
120 DATA 125,79,177,30,237,38,19
,189
130 DATA 20,10,182,255,0,129,254
,16
140 DATA 39,255,157,129,126,38,2
43,126
150 DATA 15,255,189,26,190,189,3
7,206
160 DATA 189,28,110,189,29,35,18
9,16
170 DATA 162,189,16,152,189,30,1
24,189
180 DATA 25,200,189,23,174,189,3
6,235
190 DATA 16,142,0,0,49,33,16,140
200 DATA 9,196,39,2,32,246,126,1
6
210 DATA 68,79,189,25,228,57,128
,184
220 DATA 255,15,57,182,39,116,12
9,180
230 DATA 36,7,139,60,183,39,116,
32
240 DATA 3,127,39,116,189,29,109
,57
250 DATA 57,255,255,255,255,255,
255,255
260 DATA 255,0,0,0,0,0,0,0
270 DATA 0,0,0,0,0,134,128,184
280 DATA 255,15,182,255,15,183,4
,0
290 DATA 32,243,0,0,0,0,0,0
300 DATA 0,0,0,0,4,0,0,0
310 DATA 0,0,0,0,0,0,0,0
320 DATA 4,0,0,0,0,0,0,0
330 DATA 0,0,0,0,0,0,0,0
340 DATA 83,251,255,255,255,255,
255,255
350 DATA 255,255,255,255,255,255
,255,255
360 DATA 255,255,255,255,255,255
,255,255
370 DATA 255,255,255,255,255,255
,255,255
380 DATA 255,255,255,255,255,255
,255,255
390 DATA 255,255,255,255,255,255
,255,255
400 DATA 255,255,255,255,255,255
,255,255
410 DATA 255,255,255,255,255,255
,255,255
420 DATA 255,0,0,0,0,0,0,0
430 DATA 0,0,0,0,0,0,0,0
440 DATA 0,0,0,0,0,0,0,0
450 DATA 0,0,0,0,0,0,0,0
460 DATA 0,0,0,0,0,0,0,0
470 DATA 0,0,0,0,0,0,0,0
480 DATA 0,0,0,0,0,0,0,0
490 DATA 0,0,0,0,0,0,0,0
500 DATA 35,255,255,255,255,255,
255,255
510 DATA 255,255,255,255,255,255
,255,255
520 DATA 255,255,255,255,255,189
,21,224
530 DATA 189,21,224,189,21,224,1
27,255
540 DATA 201,127,255,34,127,255,
202,127
550 DATA 255,206,127,255,192,127
,255,194
560 DATA 127,255,196,142,17,248,
16,142
570 DATA 4,0,95,166,128,167,160,
92
```

```
580 DATA 193,78,39,2,32,245,182,
30
590 DATA 220,183,15,161,182,30,2
21,183
600 DATA 15,162,182,30,222,183,1
5,163
610 DATA 182,30,223,183,15,164,1
82,30
620 DATA 224,183,15,165,134,56,1
83,15
630 DATA 160,57,4,4,4,4,4,4
640 DATA 4,0,0,0,0,0,0,0
650 DATA 0,3,12,21,5,32,14,15
660 DATA 20,8,9,14,7,32,5,17
670 DATA 21,1,12,19,32,19,15,13
680 DATA 5,20,8,9,14,7,32,32
690 DATA 32,3,15,14,7,18,1,20
700 DATA 21,12,1,20,9,15,14,19
710 DATA 32,6,9,14,9,19,8,5
720 DATA 4,32,16,1,18,20,15,14
730 DATA 5,12,15,1,4,32,14,5
740 DATA 24,20,32,16,1,18,20,0
750 DATA 0,0,0,0,0,0,0,0
760 DATA 0,0,0,0,0,0,0,0
770 DATA 0,0,0,0,0,134,255,183
780 DATA 43,196,183,43,197,183,4
3,198
790 DATA 183,43,199,183,43,164,1
83,43
```

```
800 DATA 165,183,43,166,183,43,1
67,189
810 DATA 21,224,189,21,224,189,2
1,224
820 DATA 182,30,220,177,30,230,3
4,42
830 DATA 37,70,182,30,221,177,30
,231
840 DATA 34,32,37,60,182,30,222,
177
850 DATA 30,232,34,22,37,50,182,
30
860 DATA 223,177,30,233,34,12,37
,40
870 DATA 182,30,224,177,30,234,3
4,2
880 DATA 32,30,182,30,220,183,30
,230
890 DATA 182,30,221,183,30,231,1
82,30
900 DATA 222,183,30,232,182,30,2
23,183
910 DATA 30,233,182,30,224,183,3
0,234
920 DATA 189,27,66,57,0,0,0,0
930 DATA 0,0,0,0,0,0,0,0
940 DATA 0,0,0,0,4,0,0,0
950 DATA 0,0,4,0,4,0,4,0
960 DATA 4,0,0,0,0,0,0,0
```

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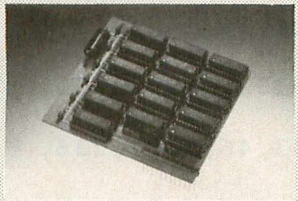

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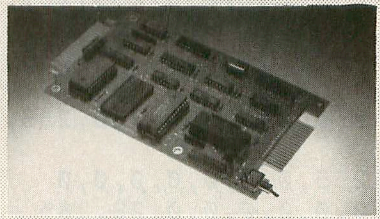

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```
970 DATA 0,0,0,0,0,0,0,0
980 DATA 194,251,255,255,255,255
,255,255
990 DATA 255,187,185,197,161,222
,7,255
1000 DATA 82,161,197,11,0,0,171,
238
1010 DATA 161,181,1,2,221,161,16
1,2
1020 DATA 4,160,240,0,255,66,89,
32
1030 DATA 67,72,82,73,83,32,77,6
7
1040 DATA 75,69,82,78,65,78,255,
255
1050 DATA 255,255,255,255,255,25
5,255,255
1060 DATA 255,3,1,13,0,0,0,0
1070 DATA 0,0,0,0,0,0,0,0
1080 DATA 0,0,0,0,0,0,0,0
1090 DATA 0,0,0,0,0,0,0,0
1100 DATA 0,0,0,0,0,0,0,0
1110 DATA 0,0,0,0,0,0,0,0
1120 DATA 0,0,0,0,0,0,0,0
1130 DATA 0,0,0,0,0,0,0,0
1140 DATA 193,255,255,255,255,25
5,74,32
1150 DATA 32,255,255,255,255,255
,255,255
1160 DATA 255,255,255,255,255,25
5,255,255
1170 DATA 255,255,255,255,255,25
5,255,255
1180 DATA 255,255,255,255,255,25
5,255,255
1190 DATA 255,255,255,255,255,25
5,255,255
1200 DATA 255,255,255,255,255,25
5,255,255
1210 DATA 255,255,255,255,255,25
5,255,255
1220 DATA 255,0,0,0,0,0,0,0
1230 DATA 0,0,0,0,0,0,28,185
1240 DATA 187,185,197,162,30,13,
185,236
1250 DATA 187,185,197,189,51,177
,106,0
1260 DATA 188,225,183,77,174,84,
173,45
1270 DATA 173,196,0,0,0,0,0,85
1280 DATA 85,85,85,85,85,85,85,8
5
1290 DATA 85,85,85,85,85,85,85,8
5
1300 DATA 85,85,85,85,85,85,85,8
5
1310 DATA 85,85,85,142,42,77,134
,13
1320 DATA 189,23,148,142,42,78,1
34,19
1330 DATA 189,23,148,142,42,79,1
34,20
1340 DATA 189,23,148,142,42,80,1
34,21
1350 DATA 189,23,148,142,42,82,1
34,22
1360 DATA 189,23,148,142,42,83,1
34,23
1370 DATA 189,23,148,142,42,84,1
34,24
1380 DATA 189,23,148,142,42,85,1
34,25
1390 DATA 189,23,148,57,70,68,32
,13
1400 DATA 0,198,30,247,20,179,13
4,255
1410 DATA 16,142,0,15,189,23,51,
246
1420 DATA 20,179,90,193,1,39,5,2
47
1430 DATA 20,179,32,234,57,0,0,0
1440 DATA 0,0,0,0,0,0,0,0
1450 DATA 0,0,0,0,0,0,0,0
1460 DATA 0,118,255,255,255,255,
255,255
1470 DATA 255,255,255,255,255,25
5,255,255
1480 DATA 255,255,255,255,255,25
5,255,255
1490 DATA 255,255,255,255,255,25
5,255,255
1500 DATA 255,255,255,255,255,25
5,255,84
1510 DATA 85,84,84,69,84,85,84,6
6
1520 DATA 13,13,13,32,2,191,21,2
2
1530 DATA 142,36,14,16,142,0,2,1
34
1540 DATA 255,230,132,189,23,51,
48,1
1550 DATA 140,36,33,46,2,32,236,
190
1560 DATA 21,22,57,0,0,0,0,0
1570 DATA 0,0,0,0,0,0,0,0
1580 DATA 0,0,0,0,0,0,0,0
1590 DATA 0,0,0,0,0,0,0,0
1600 DATA 0,0,0,0,0,0,0,0
1610 DATA 0,0,0,0,0,0,0,0
1620 DATA 0,25,255,255,255,255,2
55,255
1630 DATA 255,255,255,255,255,25
5,255,255
1640 DATA 255,255,255,255,255,25
5,255,59
1650 DATA 235,16,142,0,0,49,33,1
6
1660 DATA 140,15,160,38,248,57,1
98,50
1670 DATA 16,142,0,40,189,23,51,
134
1680 DATA 255,198,30,16,142,0,20
```

```
,189
1690 DATA 23,51,57,120,246,21,11
9,90
1700 DATA 193,30,37,5,247,21,119
,32
1710 DATA 223,57,0,16,142,31,49,
189
1720 DATA 37,37,57,0,0,0,0,0
1730 DATA 0,0,0,0,0,0,0,0
1740 DATA 5,185,161,161,222,7,25
5,82
1750 DATA 161,197,11,0,0,171,238
,161
1760 DATA 181,1,2,221,161,161,2,
4
1770 DATA 30,0,79,0,0,0,0,0
1780 DATA 27,255,255,255,255,255
,255,255
1790 DATA 255,255,255,255,255,83
,84,69
1800 DATA 83,84,70,70,70,70,70,8
4
1810 DATA 85,84,66,65,83,73,67,6
7
1820 DATA 67,67,67,67,67,67,67,6
7
1830 DATA 67,67,67,67,67,67,255,
134
1840 DATA 255,198,50,16,142,0,23
0,189
1850 DATA 23,51,134,255,198,25,1
6,142
1860 DATA 0,115,189,23,51,134,25
5,198
1870 DATA 50
```

```
160 ......230  1090 .....168
320 ......226  1230 ......73
490 ......123  1410 .....147
630 .......99  1540 .....115
790 ......198  1690 ......96
930 .......43  END .....189
```

Listing 2: TWO

```
10 REM %%%%%%%%%%%%%%%%%%%%%%%%
       %%%      PART #2 TUT    %%%
       %%% RUN THEN LOAD #3    %%%
       %%%%%%%%%%%%%%%%%%%%%%%%
15 FOR X=21960 TO 23400:READ DT:
POKE X,DT:NEXT X
20 DATA 16,142,0,230,189,23,51,5
7
30 DATA 171,67,67,67,67,67,67,67
40 DATA 67,67,67,67,67,67,67,0
50 DATA 134,255,198,30,16,142,0,
100
```

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60 DATA 189,23,51,134,200,198,30
,16
70 DATA 142,0,90,189,23,51,134,2
55
80 DATA 198,30,16,142,0,90,189,2
3
90 DATA 51,134,200,198,25,16,142
,0
100 DATA 110,189,23,51,134,200,1
98,30
110 DATA 16,142,0,110,189,23,51,
57
120 DATA 255,255,255,255,255,255
,255,255
130 DATA 255,255,255,255,255,255
,255,13
140 DATA 78,85,82,67,67,67,67,67
150 DATA 67,67,67,67,67,67,67,67
160 DATA 67,67,67,67,67,67,67,67
170 DATA 67,67,67,13,190,39,214,
189
180 DATA 27,112,190,31,6,188,39,
214
190 DATA 38,6,204,0,0,253,31,6
200 DATA 190,31,8,188,39,214,38,
6
210 DATA 204,0,0,253,31,8,190,31
220 DATA 10,188,39,214,38,6,204,
0
230 DATA 0,253,31,10,190,31,12,1
88
240 DATA 39,214,38,6,204,0,0,253
250 DATA 31,12,190,31,14,188,39,
214
260 DATA 38,6,204,0,0,253,31,14
270 DATA 190,31,16,188,39,214,38
,6
280 DATA 204,0,0,253,31,16,189,2
1
290 DATA 24,190,39,214,189,27,13
7,57
300 DATA 38,52,182,40,161,129,0,
38
310 DATA 45,182,58,61,129,0,38,3
8
320 DATA 182,58,33,129,0,38,31,1
82
330 DATA 30,235,129,9,44,24,76,1
83
340 DATA 30,235,189,25,37,134,85
,183
350 DATA 40,189,183,40,161,183,5
8,61
360 DATA 183,58,33,189,21,202,57
,0
370 DATA 0,0,0,0,231,137,255,65
380 DATA 231,136,161,57,0,0,182,
30
390 DATA 223,129,10,37,8,128,10,
183
400 DATA 30,223,124,30,222,182,3
0,222
410 DATA 129,10,37,8,128,10,183,
30
420 DATA 222,124,30,221,182,30,2
21,129
430 DATA 10,37,8,128,10,183,30,2
21
440 DATA 124,30,220,182,30,220,1
29,10
450 DATA 37,16,128,10,183,30,220
,182
460 DATA 30,237,76,129,9,46,3,18
3
470 DATA 30,237,57,183,30,225,18
2,255
480 DATA 3,132,247,183,255,3,182
,255
490 DATA 1,132,247,183,255,1,134
,8
500 DATA 186,255,35,183,255,35,1
6,191
510 DATA 30,228,16,190,30,228,18
2,30
520 DATA 225,183,255,32,49,63,38
,252
530 DATA 79,183,255,32,16,190,30
,228
540 DATA 49,63,38,252,90,38,227,
57
550 DATA 134,0,183,255,197,183,2
55,195
560 DATA 183,255,203,183,255,207
,183,255
570 DATA 200,134,255,183,255,34,
57,134
580 DATA 0,142,40,0,167,128,140,
64
590 DATA 0,38,249,57,16,142,31,6
4
600 DATA 198,7,61,49,171,198,0,1
66
610 DATA 160,167,132,48,136,32,9
2,193
620 DATA 7,39,2,32,242,57,142,41
630 DATA 2,182,30,220,189,23,148
,142
640 DATA 41,3,182,30,221,189,23,
148
650 DATA 142,41,4,182,30,222,189
,23
660 DATA 148,142,41,5,182,30,223
,189
670 DATA 23,148,142,41,6,182,30,
224
680 DATA 189,23,148,57,142,40,13
,134
690 DATA 11,189,23,148,142,40,14
,134
700 DATA 12,189,23,148,142,40,15
,134
710 DATA 13,189,23,148,142,40,16
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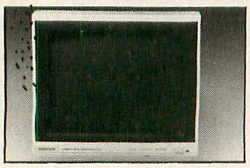

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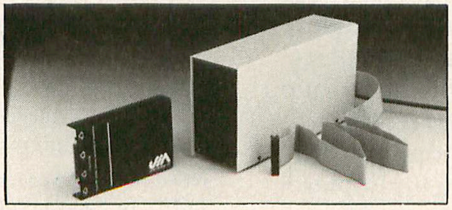

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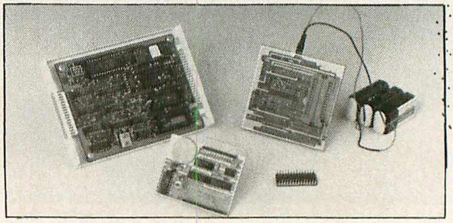

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```
,134
720 DATA 14,189,23,148,142,40,17
,134
730 DATA 15,189,23,148,57,142,41
,13
740 DATA 182,30,230,189,23,148,1
42,41
750 DATA 14,182,30,231,189,23,14
8,142
760 DATA 41,15,182,30,232,189,23
,148
770 DATA 142,41,16,182,30,233,18
9,23
780 DATA 148,142,41,17,182,30,23
4,189
790 DATA 23,148,57,142,40,108,13
4,16
800 DATA 189,35,115,142,40,109,1
34,17
810 DATA 189,35,115,142,40,110,1
34,18
820 DATA 189,35,115,142,40,111,1
34,19
830 DATA 189,35,115,142,40,112,1
82,30
840 DATA 235,189,35,115,57,142,4
0,20
850 DATA 182,30,236,189,23,148,1
42,40
860 DATA 21,182,30,237,189,23,14
8,57
870 DATA 182,30,250,198,64,61,14
2,32
880 DATA 8,48,139,191,39,215,79,
95
890 DATA 16,142,43,224,16,191,39
,213
900 DATA 189,24,200,166,132,189,
24,216
910 DATA 189,24,184,189,24,184,1
89,24
920 DATA 184,189,24,184,189,24,1
84,189
930 DATA 24,184,189,24,184,92,19
3,8
940 DATA 39,45,189,24,200,49,169
,2
950 DATA 100,48,1,189,24,208,32,
208
960 DATA 189,24,200,48,1,49,36,1
66
970 DATA 132,189,24,208,189,24,2
16,57
980 DATA 190,39,215,16,190,39,21
3,57
990 DATA 191,39,215,16,191,39,21
3,57
1000 DATA 247,39,212,198,80,61,1
42,33
1010 DATA 72,48,139,79,95,166,12
8,167
1020 DATA 164,166,128,167,33,166
,128,167
1030 DATA 34,166,128,167,35,92,1
93,20
1040 DATA 39,5,49,168,32,32,230,
246
1050 DATA 39,212,57,182,30,250,1
98,2
1060 DATA 61,253,39,214,142,34,2
50,48
1070 DATA 139,236,132,253,30,248
,252,39
1080 DATA 214,142,35,4,48,139,23
6,132
1090 DATA 253,31,2,252,39,214,14
2,35
1100 DATA 14,48,139,236,132,253,
30,255
1110 DATA 252,39,214,142,35,24,4
8,139
1120 DATA 236,132,253,30,253,252
,39,214
1130 DATA 142,35,34,48,139,236,1
32,253
1140 DATA 31,4,182,30,250,183,31
,1
1150 DATA 183,31,18,204,0,0,253,
31
1160 DATA 6,253,31,8,253,31,10,2
53
1170 DATA 31,12,253,31,14,253,31
,16
1180 DATA 252,30,248,253,30,251,
57,190
1190 DATA 30,251,48,136,224,140,
43,224
1200 DATA 37,17,190,30,251,95,22
5,136
1210 DATA 192,38,8,225,136,193,3
8,3
1220 DATA 134,1,57,79,57,190,30,
251
1230 DATA 95,225,137,2,64,38,9,2
25
1240 DATA 137,2,65,38,3,134,1,57
1250 DATA 79,57,190,30,251,95,22
5,31
1260 DATA 38,9,225,137,1,255,38,
3
1270 DATA 134,1,57,79,57,190,30,
251
1280 DATA 95,225,2,38,9,225,137,
2
1290 DATA 2,38,3,134,1,57,79,57
1300 DATA 190,30,251,16,142,34,2
16,79
1310 DATA 95,166,160,167,132,166
,160,167
1320 DATA 1,92,193,17,39,5,48,13
6
1330 DATA 32,32,238,57,190,30,25
```

```
1,95
1340 DATA 167,132,167,1,92,193,1
7,39
1350 DATA 5,48,136,32,32,242,57,
189
1360 DATA 25,111,129,0,39,15,189
,16
1370 DATA 152,190,30,251,48,136,
192,191
1380 DATA 30,251,189,25,200,57,1
89,25
1390 DATA 141,129,0,39,15,189,16
,152
1400 DATA 190,30,251,48,136,64,1
91,30
1410 DATA 251,189,25,200,57,189,
25,162
1420 DATA 129,0,39,14,189,16,152
,190
1430 DATA 30,251,48,31,191,30,25
1,189
1440 DATA 25,200,57,189,25,181,1
29,0
1450 DATA 39,14,189,16,152,190,3
0,251
1460 DATA 48,1,191,30,251,189,25
,200
1470 DATA 57,137,190,30,251,79,1
98,255
1480 DATA 48,137,0,194,166,132,1
29,0
1490 DATA 38,4,231,128,32,246,18
9,20
1500 DATA 180,95,18,16,190,30,25
1,49
1510 DATA 169,0,194,95,191,39,21
4,16
1520 DATA 188,39,214,39,4,231,16
0,32
1530 DATA 242,189,27,192,57,190,
30,251
1540 DATA 79,198,255,48,137,0,19
1,166
1550 DATA 132,129,0,38,6,231,132
,48
1560 DATA 31,32,244,189,20,180,9
5,18
1570 DATA 16,190,30,251,49,169,0
,191
1580 DATA 95,191,39,214,16,188,3
9,214
1590 DATA 39,6,231,164,49,63,32,
240
1600 DATA 48,31,189,27,192,57,17
3,159
1610 DATA 160,10,182,1,90,129,59
,37
1620 DATA 15,189,26,254,129,254,
39,50
1630 DATA 129,126,39,46,189,26,5
9,57
1640 DATA 129,2,46,15,189,26,254
,129
1650 DATA 254,39,36,129,126,39,3
2,189
1660 DATA 26,37,57,182,1,91,129,
59
1670 DATA 37,4,189,26,14,57,129,
2
1680 DATA 46,16,189,25,247,57,18
2,255
1690 DATA 0,57,189,26,82,32,3,18
9
1700 DATA 26,133,189,25,200,57,1
82,30
1710 DATA 250,198,20,61,142,35,5
0,48
1720 DATA 139,95,16,190,30,255,1
89,27
1730 DATA 35,32,19,166,128,167,1
64,166
1740 DATA 128,167,33,92,193,10,3
9,5
1750 DATA 49,168,32,32,238,57,14
2,36
1760 DATA 14,16,190,30,253,95,18
9,27
1770 DATA 35,57,134,3,183,30,237
,127
1780 DATA 30,220,127,30,221,127,
30,222
1790 DATA 127,30,223,127,30,224,
127,30
1800 DATA 250,57,204,0,0,253,31,
6
1810 DATA 253,31,8,253,31,10,253
,31
1820 DATA 12
```

180	91	1150	54
310	57	1320	182
470	49	1470	240
650	124	1750	30
830	136	END	65
970	196		

Listing 3: THREE

```
10 REM %%%%%%%%%%%%%%%%%%%%%%%
       %%%      PART #3 TUT    %%%
       %%% CONTAINS MAZE DATA%%%
       %%% RUN THEN LOAD #4  %%%
       %%%%%%%%%%%%%%%%%%%%%%%
15 FOR X=23401 TO 24921:READ DT:
POKE X,DT:NEXT X
20 DATA 253,31,14,253,31,16,57,1
6
30 DATA 142,35,250,79,95,166,160
,167
40 DATA 132,166,160,167,1,92,193
```

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Proven Technology

New CoCo 3 Utilities

Great for 512K Systems! From Color Venture and OWL-WARE

PRINTER LIGHTNING

A great print spooler which gives you 44K print buffer from a 128K CoCo and up to 438K (200 pages!) from a 512K CoCo. With this spooler you can run a program while you are printing a file. The spooler does not slow down the computer to any noticeable extent while you are running a second program and no lost characters arise. Baud rates selectable. ***Printer Lightning*** can reside in memory along with ***RAMDISK***!

RAMDISK

Using 512K CoCo 3 you have access to 2 additional disk drives in RAM. All disk commands are supported, and the data are Reset button protected. You can now have up to 5 disk drive capacities on line at once and can assign the ram disks to any drive number. By making the ramdisk Drive 0, all programs which require a lot of drive access will run much faster. You can have the ***RAMDISK*** in memory at the same time as the ***Printer Lightning***!

BACKUP LIGHTNING

This program is the fastest way to make backup copies of your files using a 512K CoCo. You can backup 35, 40, or 80 track disks single or double sided. Both RS and OS-9 disks may be backed up. The original disk is saved to memory and a copy can be made on an ***unformatted disk*** every 45 seconds! The lightning read, write, format, and verify routines that were developed make this program much quicker that RSDOS or OS-9 for backups. This will become one of your most used programs!

·NEW·NEW· **Only $19.95 each. 3 for $39.95.**

SPECIAL With our 512K Upgrade (Next page) only $2. each or 3 for $5!

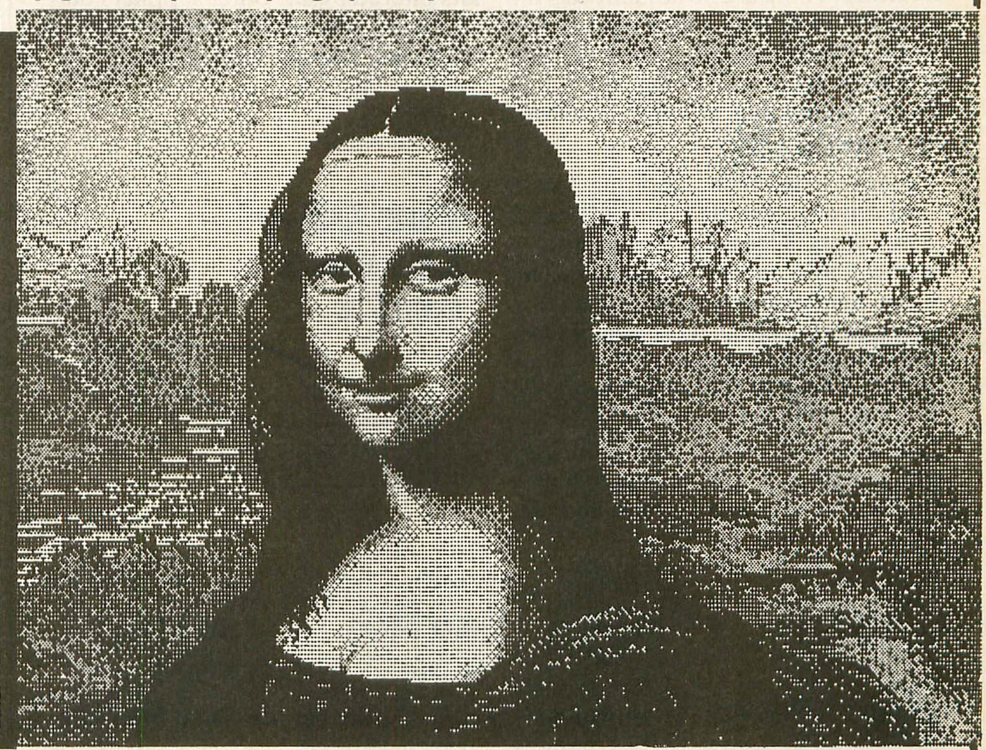
Announcing:

The finest graphics/drawing program for the COCO 3!

Da Vinci 3

- 16 colors on screen at one time
- Modify each color from 64 available colors
- Use composite or RGB monitor
- Draw with custom paintbrushes
- Full resolution 320 X 192
- Picture converter for conversion of COCO 2 pictures to COCO 3
- Multiple text fonts
- Accepts input from joystick, X-pad, mouse, or touch-pad
- Boxes, circles, line, paint generation
- Screen dump for Tandy mono and color ink-jet printers, (NX-10 and others pending)
- Sensible price
- No additional hardware required because of course/fine joystick movement modes
- Zoom mode for individual pixel editing
- Great on screen menu which is removable at the touch of a key to allow full screen edit

128K or 512K COCO 3 $37.95



Super I/O Board for OS-9

Each Board Provides 2 Serial Ports and Centronics Parallel Port

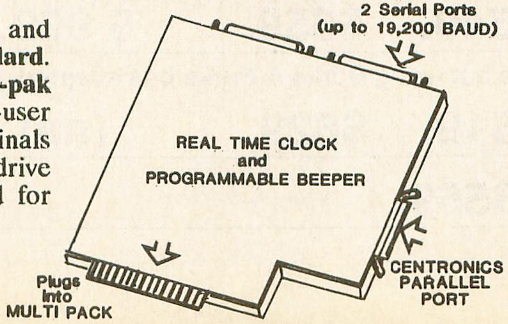
First Board has Real Time Clock and Beeper... With Second Board up to 5 Users

More Ads... →

The serial ports are usable **up to 19,200 Baud**, and the parallel port is a **true Centronics standard**. Plug into your multi-pak. **On CoCo 3, multi-pak must be upgraded.** You have a multi-user system with additional computers or terminals plugged into the serial ports. An OWL hard drive and 512K upgrade are strongly recommended for multi-user systems.

Intro Price... **$169.**

BOARD 2...$145.



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Proven

On the Razor's Edge of

Basic and OS-9 Hard Drive Systems

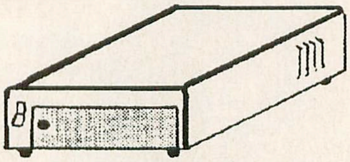
Proven Performance for Demanding Home or Business Users

Every hard drive which has been produced by OWL-WARE during the last 3 years is **complete**. A system consists of software, hard drive, controller, heavy-duty power supply, and LR Tech Interface. There are no hidden costs for assembly or testing. When a drive system is ordered, we fully **assemble**, **test**, and **burn-in** the system for 3 full days. This ensures dependability and optimum performance.

We have now been supplying CoCo hard drive systems and parts for more than 3 years. This is the longest history in the CoCo market of any system. Some other advertisers are stating that they have one of the most reliable systems for the CoCo *with all of 4 months history in the CoCo hard drive market*! We have reached our position in the hard drive market by providing our customers with a quality product that they (and we) can be proud to own and use.

Because of many requests for a lower price system in kit form, we are now selling a kit of all parts at a significant discount compared to our regular prices. We recommend this kit (or any kits offered by any other supplier) only to those who have experience in electronic assembly and OS-9.

For OS-9 Levels 1 and 2



10 Meg.	20 Meg.	40 Meg.	80 Meg. (2 X 40 Meg.)
System Prices: (Includes Hard Drive, Controller, LR Tech Interface, Software. Fully assembled and tested.)			
$469.	$599.	$725.	$1,069.
Kit Prices: (LR Tech System as above but not assembled or tested.)			
$419.	$549.	$659.	$ 999.
Kit Prices: (As above but using Burke & Burke bus adapter)			
(na)	$519.	$629.	(na)
30 Meg Kit:	$559.		

OWL Hard Drive BASIC 3

There have been several ads in this magazine about BASIC for Color Computer hard drive systems. These ads sometimes only tell a part of the story. Our BASIC system price includes **assembly**, **testing**, and **3-day burn-in** period. We do not require a Multi-pak to operate.

Our hard drive systems are fast, reliable, and reasonable in price. This has been proven by hundreds of users over the past 3 years. We do not have to turn off error checking for speed. We achieve high speed BASIC from a unique indexing method.

The table below will summarize some of the key points about our BASIC hard drive system and two other systems. We believe that we have the best BASIC interface for CoCo hard drives available.

BASIC Hard Drive Systems*

Feature	OWL	B&B	RGB
Drive Portion Available	Entire	Entire(?)	Entire
User Sets BASIC/OS-9 Partitions	YES	Yes	No
Add to Existing OS-9 Drive Without Reformat	YES	Yes(?)	No
Drives 0-3 Hard/Floppy	YES	No	Yes
Built in Park	YES	No	Yes
Speed*	FAST	Fast	Fast

*All feature details are believed to be true at time of writing and are subject to change. We believe that our BASIC hard drives are the fastest due to our indexing method, but all three systems are fast. On ours all BASIC commands work including DSKINI, DSKI$, and DSKO$.

Prices: With/Without Hard Drive

$35./$79.

Technology
the Color Computer Frontier

DISK DRIVES

Bonus!
Special
Bundled
Software
with any
Disk Drive
Purchase!

Floppy Drive Systems

The Highest Quality for Service Now and for Years to Come

Use our WHISPER DRIVE for the finest, quietist drive

Drive 0 Systems (Half Height, Double Sided, Direct Drives) $219.

Drive 0 systems complete with drive, controller, legal DOS, cable, case, power supply, and manual

Drive 1 Systems (Half Height, Double Sided, Direct Drives) $129.

New 3.5", 720K Drives for OS-9 with case & Power Supply $179.

Drive 1 Systems have drive, case, power supply. (You may require optional cable and/or DOS chip to use)

Special for 0/1 Combos (Drives 0,1,2,3) $315.

HALF- HEIGHT DRIVE UPGRADES FOR RS HORIZONTAL CASES

Why only double the capacity of your system when you can triple in the same case? Kit includes: double-sided to fit your case, chip to run both sides of new drive, hardware, and detailed instructions. Easy! Takes only 5 minutes!

Model $119. Model $129.
500 501 or 502

All drives are new and fully assembled. We ship only FULLY TESTED and CERTIFIED at these low prices. We use Fuji, YE Data, and other fine brands. No drives are used or surplus unless otherwise stated to you when you order. We appear to be the one of the few advertisers in Rainbow who can truly make this claim. We have 5 years experience in the CoCo disk drive market! We are able to provide support when you have a problem.

Drives 1 Year Warranty

OWL Phones

Order Numbers (only)
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1-215-682-6855

Technical Help
1-215-837-1917

OWL WARE Software Bundle

Disk Tutorial/Utilities/Games

DISK TUTOR Ver 1.1

Learn how to use your disk drive from this multi-lesson, machine language program. This tutor takes you through your lessons and corrects your mistakes for a quick, painless disk drive introduction. (This professionally written tutor is easily worth the bundle's total price.)

OWL DOS

An operating system that gives faster disk access and allows the use of double-sided drives. Corrects a floating point number error on early CoCo systems.

COPY-IT

Quickly copies selected programs between disks. A wild card option selects groups of programs to copy.

VERIFY

Verifies reading of each sector. Bad sectors are listed on the screen.

2 GAMES

We will select 2 games from our stock. These sold for more than $20 each.

If sold separately this is more than $125 worth of software!!

Do not mistake this software with cheap, non-professional "Public Domain" software which is being offered by others. All of this software is copyrighted and professional in quality. The tutor is unique with us and has helped thousands of new users learn their disk drive.

only $27.95
(or even better)
only $6.95 with

Our prices include a discount for cash but do not include shipping.

OWL-WARE has a liberal warranty policy. During the warranty period, all defective items will be repaired or replaced at our option at no cost to the buyer except for shipping costs. Call our tech number for return. Return of non-defective or unauthorized returns are subject to a service charge.

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Mertztown, PA 19539

```
,10
50 DATA 39,5,48,136,32,32,238,57
60 DATA 79,95,167,132,167,1,92,1
93
70 DATA 10,39,5,48,136,32,32,242
80 DATA 57,189,36,44,57,0,38,4
90 DATA 134,1,32,26,129,1,38,4
100 DATA 134,2,32,18,129,2,38,4
110 DATA 134,4,32,10,129,3,38,4
120 DATA 134,6,32,2,134,8,187,16
130 DATA 190,31,6,189,27,235,16,
190
140 DATA 31,8,189,27,235,16,190,
31
150 DATA 10,189,27,235,16,190,31
,12
160 DATA 189,27,235,16,190,31,14
,189
170 DATA 27,235,16,190,31,16,189
,27
180 DATA 235,57,16,140,0,0,39,24
9
190 DATA 140,0,0,39,244,31,32,18
9
200 DATA 28,29,189,28,41,189,28,
29
210 DATA 189,28,41,189,28,29,189
,28
220 DATA 41,189,28,29,189,28,41,
189
230 DATA 28,29,189,28,41,189,28,
29
240 DATA 189,28,41,57,16,191,39,
214
250 DATA 188,39,214,39,16,49,33,
57
260 DATA 16,191,39,214,188,39,21
4,39
270 DATA 4,49,168,31,57,253,39,2
14
280 DATA 190,39,214,189,27,112,1
90,39
290 DATA 214,189,27,137,189,27,1
54,189
300 DATA 22,68,142,0,0,57,182,30
310 DATA 250,198,20,61,16,142,35
,150
320 DATA 49,171,95,166,160,167,1
32,166
330 DATA 160,167,1,92,193,10,39,
5
340 DATA 48,136,32,32,238,190,31
,6
350 DATA 16,142,31,6,134,42,189,
28
360 DATA 183,190,31,8,16,142,31,
8
370 DATA 134,84,189,28,183,190,3
1,10
380 DATA 16,142,31,10,134,126,18
9,28
```

```
390 DATA 183,190,31,12,16,142,31
,12
400 DATA 134,168,189,28,183,190,
31,14
410 DATA 16,142,31,14,134,210,18
9,28
420 DATA 183,190,31,16,16,142,31
,16
430 DATA 134,252,189,28,183,57,1
40,0
440 DATA 0,38,250,124,31,24,177,
31
450 DATA 24,34,19,190,31,4,175,1
64
460 DATA 189,28,79,134,240,177,3
1,24
470 DATA 38,227,127,31,24,57,128
,40
480 DATA 177,31,24,34,216,190,31
,4
490 DATA 189,27,112,57,79,95,161
,31
500 DATA 38,8,161,137,1,31,38,2
510 DATA 198,1,57,79,95,161,2,38
520 DATA 8,161,137,1,34,38,2,198
530 DATA 1,57,79,95,161,136,192,
38
540 DATA 7,161,136,193,38,2,198,
1
550 DATA 57,79,95,161,137,1,96,3
8
560 DATA 8,161,137,1,97,38,2,198
570 DATA 1,57,190,31,4,79,188,31
580 DATA 6,38,3,189,29,98,134,1
590 DATA 188,31,8,38,3,189,29,98
600 DATA 134,2,188,31,10,38,3,18
9
610 DATA 29,98,134,3,188,31,12,3
8
620 DATA 3,189,29,98,134,4,188,3
1
630 DATA 14,38,3,189,29,98,134,5
640 DATA 188,31,16,38,14,189,29,
98
650 DATA 57,16,142,31,44,49,166,
134
660 DATA 5,167,164,57,190,31,4,4
8
670 DATA 137,254,128,79,16,190,3
1,6
680 DATA 188,31,6,39,56,134,1,16
690 DATA 190,31,8,188,31,8,39,45
700 DATA 134,2,16,190,31,10,188,
31
710 DATA 10,39,34,134,3,16,190,3
1
720 DATA 12,188,31,12,39,23,134,
4
730 DATA 16,190,31,14,188,31,14,
39
740 DATA 12,134,5,16,190,31,16,1
```

```
88
750 DATA 31,16,39,1,57,142,31,44
760 DATA 48,134,16,188,30,251,34
,6
770 DATA 198,2,231,132,32,4,198,
0
780 DATA 231,132,182,39,116,129,
180,38
790 DATA 1,57,166,132,139,1,167,
132
800 DATA 57,190,39,214,189,28,22
9,193
810 DATA 0,39,14,189,27,137,190,
39
820 DATA 214,48,31,191,39,214,18
9,28
830 DATA 79,57,190,39,214,189,28
,244
840 DATA 193,0,39,14,189,27,137,
190
850 DATA 39,214,48,1,191,39,214,
189
860 DATA 28,79,57,190,39,214,189
,29
870 DATA 18,193,0,39,15,189,27,1
37
880 DATA 190,39,214,48,136,64,19
1,39
890 DATA 214,189,28,79,57,190,39
,214
900 DATA 189,29,3,193,0,39,15,18
9
910 DATA 27,137,190,39,214,48,13
6,192
920 DATA 191,39,214,189,28,79,57
,140
930 DATA 43,224,37,54,191,39,214
,129
940 DATA 0,38,7,189,29,243,189,3
0
950 DATA 38,57,129,1,38,7,189,29
960 DATA 218,189,30,38,57,129,2,
38
970 DATA 7,189,29,243,189,30,12,
57
980 DATA 129,3,38,7,189,29,218,1
89
990 DATA 30,12,57,129,5,38,3,189
1000 DATA 30,38,57,190,31,6,182,
31
1010 DATA 44,189,30,64,190,39,21
4,191
1020 DATA 31,6,190,31,8,182,31,4
5
1030 DATA 189,30,64,190,39,214,1
91,31
1040 DATA 8,190,31,10,182,31,46,
189
1050 DATA 30,64,190,39,214,191,3
1,10
1060 DATA 190,31,12,182,31,47,18
9,30
1070 DATA 64,190,39,214,191,31,1
2,190
1080 DATA 31,14,182,31,48,189,30
,64
1090 DATA 190,39,214,191,31,14,1
90,31
1100 DATA 16,182,31,49,189,30,64
,190
1110 DATA 39,214,191,31,16,57,0,
0
1120 DATA 0,0,0,0,0,0,0,0
1130 DATA 255,255,0,0,2,0,0,0
1140 DATA 0,0,3,0,3,48,175,2
1150 DATA 40,1,40,28,57,129,57,4
4
1160 DATA 37,0,59,58,59,156,49,1
42
1170 DATA 0,53,223,56,117,47,122
,47
1180 DATA 51,46,245,51,108,53,25
1,52
1190 DATA 177,0,255,255,255,255,
255,240
1200 DATA 0,13,53,17,67,34,255,2
55
1210 DATA 255,255,255,255,255,25
5,255,255
1220 DATA 255,255,255,2,1,1,2,0
1230 DATA 2,255,255,255,255,1,0,
255
1240 DATA 255,255,255,255,5,1,25
5,84
1250 DATA 68,68,68,68,68,84,16,8
0
1260 DATA 16,16,16,16,84,84,68,4
1270 DATA 84,64,68,84,84,68,4,84
1280 DATA 4,68,84,68,68,68,84,4
1290 DATA 4,4,84,68,64,84,4,68
1300 DATA 84,84,68,64,84,68,68,8
4
1310 DATA 84,68,4,4,4,4,4,84
1320 DATA 68,68,84,68,68,84,84,6
8
1330 DATA 68,84,4,68,84,153,102,
153
1340 DATA 102,153,102,153,136,13
6,136,168
1350 DATA 136,136,136,168,32,32,
32,32
1360 DATA 32,168,168,128,128,138
,136,136
1370 DATA 168,136,136,136,168,13
6,136,136
1380 DATA 0,32,32,0,32,32,0,168
1390 DATA 136,128,168,8,136,168,
168,32
1400 DATA 32,32,32,32,32,168,136
,128
1410 DATA 128,128,136,168,16,68,
68,84
```

```
1420 DATA 68,68,68,136,168,136,1
36,136
1430 DATA 136,136,84,68,64,80,64
,68
1440 DATA 84,32,136,136,136,136,
136,32
1450 DATA 68,68,68,68,68,16,16,1
68
1460 DATA 136,128,168,128,136,16
8,80,68
1470 DATA 68,80,68,68,68,130,130
,136
1480 DATA 160,136,130,130,0,0,12
8,168
1490 DATA 128,130,170,130,162,16
2,138,4
1499 REM PART ONE'S MAZE DATA
1500 DATA 0,4,4,4,4,4,4,4
1510 DATA 0,4,4,0,0,0,4,4
1520 DATA 0,4,3,0,4,4,4,4
1530 DATA 0,4,0,0,4,4,4,4
1540 DATA 0,4,4,0,0,0,0,4
1550 DATA 0,0,0,0,1,4,4,4
1560 DATA 4,4,0,0,0,0,2,4
1570 DATA 4,4,4,4,4,4,4,4
1580 DATA 4,4,4,4,4,4,4,4
1590 DATA 0,2,4,4,0,0,2,4
1600 DATA 0,0,0,0,0,4,4,4
1610 DATA 4,4,0,1,0,4,4,0
1620 DATA 0,4,0,0,0,4,4,4
1630 DATA 0,4,0,4,0,4,4,4
1640 DATA 0,0,0,4,0,0,0,4
1650 DATA 4,4,4,4,4,4,4,4
1660 DATA 4,4,4,4,4,4,4,3
1670 DATA 0,0,0,0,4,0,4,4
1680 DATA 4,0,1,0,4,0,0,4
1690 DATA 4,0,4,0,4,0,4,4
1700 DATA 0,0,4,0,2,0,4,0
1710 DATA 0,0,4,0,4,0,4,4
1720 DATA 0,4,4,0,0,0,4,4
1730 DATA 4,4,4,4,4,4,4,4
1740 DATA 4,4,4,4,4,4,4,4
1750 DATA 4,4,3,0,4,4,4,0
1760 DATA 0,4,4,0,4,4,4,4
1770 DATA 0,4,4,0,0,4,4,3
1780 DATA 0,0,4,0,4,4,4,4
1790 DATA 0,0,0,0,0,0,4,4
1800 DATA 0,4,4,4,4,0,0,4
1810 DATA 1,4,4,4,4,4,4,4
1820 DATA 4,4,4,4,4,4,4,4
1830 DATA 0,0,0,0,4,0,0,4
1840 DATA 0,4,4,0,4,0,4,3
1850 DATA 0,0,4,0,2,0,4,4
1860 DATA 0,4,4,0,4,0,4,4
1870 DATA 0,4,0,0,4,0,4,0
1880 DATA 0,4,4,0,0,0,4,4
1890 DATA 4,4,4,1,4,4,4,0
1900 DATA 0,0,0,0,0,0,0,0
1910 DATA 0,0,0,0,0,0,0,0
1920 DATA 0
```

220	242	1330	45
410	246	1470	144
600	207	1620	234
790	171	1760	133
1020	105	END	45
1170	148		

Listing 4: FOUR

```
10 REM %%%%%%%%%%%%%%%%%%%%%%%%%
       %%%   LASTPART TUT    %%%
       %%% RUN THEN LOAD &RUN%%%
       %%% COPY PROGRAM      %%%
       %%%%%%%%%%%%%%%%%%%%%%%%%
15 FOR X=24922 TO 26405:READ DT:
POKE X,DT:NEXT X
20 DATA 0,0,0,0,0,0,0,0
30 DATA 0,0,0,0,0,0,0,0
40 DATA 0,0,0,0,0,0,0,0
50 DATA 0,0,0,0,0,0,0,0
60 DATA 0,0,0,0,0,0,0,0
70 DATA 0,0,0,0,0,0,0,0
80 DATA 0,0,0,0,0,0,0,0
90 DATA 0,0,0,0,0,0,62,0
100 DATA 0,250,58,0,0,171,42,0
110 DATA 0,163,58,0,0,135,54,0
120 DATA 0,147,50,0,0,167,58,0
130 DATA 0,171,58,0,0,170,62,0
140 DATA 0,171,0,0,0,160,254,170
150 DATA 170,250,70,170,170,164,
19,168
160 DATA 170,177,71,33,42,180,19
,52
170 DATA 74,49,71,49,18,52,19,52
180 DATA 71,49,71,33,19,52,255,4
2
190 DATA 255,63,0,0,0,0,85,85
200 DATA 87,234,253,87,212,70,25
5,87
210 DATA 245,18,255,223,244,70,2
55,255
220 DATA 245,19,0,0,52,71,0,0
230 DATA 53,19,0,0,52,71,0,0
240 DATA 55,255,0,0,52,0,0,0
250 DATA 55,63,0,0,55,52,0,0
260 DATA 55,49,0,0,55,52,0,0
270 DATA 55,49,0,0,247,52,247,25
5
280 DATA 215,49,213,255,215,52,8
5,127
290 DATA 87,63,85,85,84,0,43,21
300 DATA 85,85,33,21,253,87,55,2
3
310 DATA 255,87,51,23,255,223,52
,23
320 DATA 255,255,17,20,0,0,52,20
330 DATA 0,0,49,20,0,0,63,20
340 DATA 0,0,0,20,0,0,254,20
350 DATA 0,0,70,20,0,0,18,20
360 DATA 0,0,71,20,0,0,19,20
```

```
370 DATA 0,0,71,23,0,0,18,23
380 DATA 247,255,70,21,213,255,2
34,21
390 DATA 85,127,0,21,85,85,43,25
0
400 DATA 62,191,33,210,52,71,55,
70
410 DATA 49,19,51,18,52,71,52,69
420 DATA 49,19,17,17,20,69,52,69
430 DATA 33,17,49,18,36,70,63,17
0
440 DATA 43,250,0,0,0,0,254,42
450 DATA 191,63,70,49,19,52,18,5
2
460 DATA 71,49,71,17,19,52,19,20
470 DATA 207,49,71,17,55,52,18,3
6
480 DATA 118,49,70,33,210,36,234
,47
490 DATA 254,42,0,0,0,0,2,128
500 DATA 10,160,170,170,255,240,
63,48
510 DATA 63,252,31,255,23,240,87
,224
520 DATA 85,84,21,85,85,85,170,1
70
530 DATA 40,40,40,40,40,40,42,42
540 DATA 44,37,53,224,56,96,48,2
24
550 DATA 58,224,53,223,58,223,48
,223
560 DATA 58,223,46,95,49,142,47,
8
570 DATA 47,2,47,14,52,2,59,156
580 DATA 47,28,54,148,54,130,52,
20
590 DATA 56,117,51,113,48,237,61
,101
600 DATA 61,113,255,255,255,255,
255,255
610 DATA 0,0,63,252,31,244,19,19
6
620 DATA 6,144,8,32,32,8,32,8
630 DATA 8,32,6,144,0,0,21,4
640 DATA 5,17,1,65,10,161,42,168
650 DATA 170,170,42,168,10,160,1
,64
660 DATA 0,0,2,128,255,255,61,12
4
670 DATA 61,124,182,158,189,126,
63,252
680 DATA 63,252,255,255,4,16,1,6
4
690 DATA 3,192,1,64,5,144,86,165
700 DATA 85,84,21,80,5,64,1,64
710 DATA 42,168,170,170,157,222,
42,168
720 DATA 10,160,255,255,36,24,36
,24
730 DATA 36,24,255,255,160,10,16
8,42
```

```
740 DATA 41,104,43,232,9,96,9,96
750 DATA 0,64,0,16,4,64,1,0
760 DATA 5,80,31,244,7,253,1,244
770 DATA 0,80,1,66,5,3,1,65
780 DATA 1,69,0,85,4,16,17,132
790 DATA 67,193,7,208,17,68,67,1
93
800 DATA 7,208,17,68,66,33,0,0
810 DATA 0,20,0,85,0,117,0,85
820 DATA 21,85,172,213,170,165,1
87,20
830 DATA 21,80,5,64,168,21,8,17
840 DATA 40,80,32,64,131,234,171
,194
850 DATA 1,8,5,40,68,32,84,42
860 DATA 2,0,3,40,11,188,11,238
870 DATA 46,172,187,188,175,166,
126,224
880 DATA 126,192,24,0,0,4,0,18
890 DATA 0,18,1,18,1,42,17,168
900 DATA 18,128,26,0,168,0,160,0
910 DATA 255,255,255,255,255,255
,255,255
920 DATA 255,255,182,30,250,129,
0,38
930 DATA 4,134,1,32,26,129,1,38
940 DATA 4,134,2,32,18,129,2,38
950 DATA 4,134,4,32,10,129,3,38
960 DATA 4,134,6,32,2,134,8,187
```

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```
970 DATA 30,223,183,30,223,189,2
2,238
980 DATA 57,189,28,244,193,0,38,
28
990 DATA 189,29,3,193,0,38,21,18
1000 DATA 18,18,18,18,18,18,188,
30
1010 DATA 251,34,5,134,3,167,164
,57
1020 DATA 134,1,167,164,57,189,2
8,229
1030 DATA 193,0,38,28,189,29,3,1
93
1040 DATA 0,38,21,18,18,18,18,18
1050 DATA 18,18,188,30,251,34,5,
134
1060 DATA 2,167,164,57,134,0,167
,164
1070 DATA 57,189,28,244,193,0,38
,28
1080 DATA 189,29,18,193,0,38,21,
18
1090 DATA 18,18,18,18,18,18,188,
30
1100 DATA 251,34,5,134,1,167,164
,57
1110 DATA 134,3,167,164,57,189,2
8,229
1120 DATA 193,0,38,28,189,29,18,
193
1130 DATA 0,38,21,18,18,18,18,18
1140 DATA 18,18,188,30,251,34,5,
134
1150 DATA 2,167,164,57,134,0,167
,164
1160 DATA 57,190,31,6,16,142,31,
44
1170 DATA 189,37,37,190,31,8,16,
142
1180 DATA 31,45,189,37,37,190,31
,10
1190 DATA 16,142,31,46,189,37,37
,190
1200 DATA 31,12,16,142,31,47,189
,37
1210 DATA 37,190,31,14,16,142,31
,48
1220 DATA 189,37,37,190,31,16,18
9,21
1230 DATA 74,18,57,140,43,224,37
,33
1240 DATA 166,164,129,0,38,4,189
,36
1250 DATA 91,57,129,1,38,4,189,3
6
1260 DATA 127,57,129,2,38,4,189,
36
1270 DATA 163,57,129,3,38,3,189,
36
1280 DATA 199,57,182,31,54,129,0
,39
1290 DATA 45,190,30,255,48,136,1
58,188
1300 DATA 30,251,39,8,48,4,188,3
0
1310 DATA 251,39,1,57,190,30,255
,189
1320 DATA 27,137,127,31,54,182,3
0,250
1330 DATA 139,1,187,30,221,183,3
0,221
1340 DATA 189,22,238,189,21,224,
57,182
1350 DATA 30,250,198,2,61,142,42
,34
1360 DATA 48,139,16,142,36,14,95
,166
1370 DATA 160,167,132,166,160,16
7,1,92
1380 DATA 193,10,39,5,48,136,32,
32
1390 DATA 238,57,182,31,55,129,0
,39
1400 DATA 34,190,30,253,48,136,1
58,188
1410 DATA 30,251,39,8,48,4,188,3
0
1420 DATA 251,39,1,57,190,30,253
,189
1430 DATA 27,137,127,31,55,189,3
7,129
1440 DATA 189,21,174,57,182,31,5
5,129
1450 DATA 0,38,56,190,31,2,48,13
6
1460 DATA 95,188,30,251,38,45,18
2,30
1470 DATA 250,76,129,5,39,29,183
,30
1480 DATA 250,189,24,112,189,25,
3,189
1490 DATA 27,14,189,27,90,134,24
0,183
1500 DATA 31,24,134,1,183,31,54,
183
1510 DATA 31,55,57,126,17,148,12
7,30
1520 DATA 250,32,222,57,190,30,2
51,95
1530 DATA 172,164,39,16,48,1,172
,164
1540 DATA 39,10,92,193,17,39,42,
48
1550 DATA 136,31,32,236,190,30,2
51,189
1560 DATA 27,112,189,21,24,189,2
0,80
1570 DATA 189,25,228,190,30,248,
191,30
1580 DATA 251,189,38,181,189,27,
90,182
1590 DATA 30,237,74,183,30,237,1
```

```
89,24
1600 DATA 93,134,240,183,31,24,5
7,57
1610 DATA 16,142,31,6,189,38,14,
16
1620 DATA 142,31,8,189,38,14,16,
142
1630 DATA 31,10,189,38,14,16,142
,31
1640 DATA 12,189,38,14,16,142,31
,14
1650 DATA 189,38,14,16,142,31,16
,189
1660 DATA 38,14,57,182,31,44,129
,5
1670 DATA 39,36,182,31,45,129,5,
39
1680 DATA 29,182,31,46,129,5,39,
22
1690 DATA 182,31,47,129,5,39,15,
182
1700 DATA 31,48,129,5,39,8,182,3
1
1710 DATA 49,129,5,39,1,57,134,2
55
1720 DATA 198,20,16,142,0,2,189,
23
1730 DATA 51,57,255,189,24,112,1
82,31
1740 DATA 54,129,1,38,19,182,30,
250
1750 DATA 198,20,61,142,35,50,48
,139
1760 DATA 95,16,190,30,255,189,2
7,35
1770 DATA 182,31,55,129,1,38,11,
142
1780 DATA 36,14,16,190,30,253,95
,189
1790 DATA 27,35,57,142,40,3,134,
1
1800 DATA 189,23,148,142,40,4,13
4,16
1810 DATA 189,23,148,142,40,5,13
4,17
1820 DATA 189,23,148,142,42,123,
134,18
1830 DATA 189,23,148,142,42,124,
134,19
1840 DATA 189,23,148,142,42,125,
134,20
1850 DATA 189,23,148,57,255,255,
255,255
1860 DATA 255,206,11,184,16,206,
7,208
1870 DATA 126,15,255,63
```

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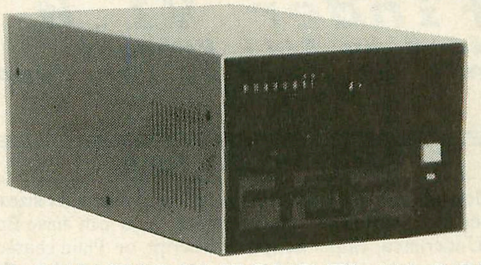

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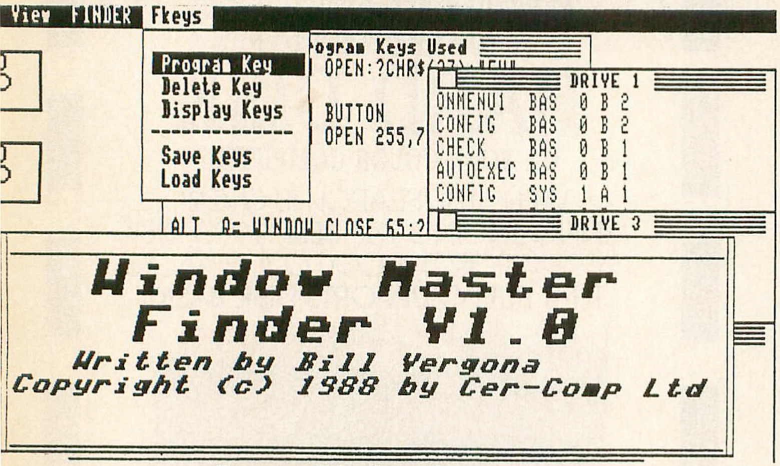


```
OPEN:?CHR$(
BUTTON
OPEN 255,7
ALT  A= WINDOW CLOSE 65:?

ONMENU1  BAS  0 B 2
CONFIG   BAS  0 B 2
CHECK    BAS  0 B 1
AUTOEXEC BAS  0 B 1
CONFIG   SYS  1 A 1
```

Window Master
Finder V1.0
Written by Bill Vergona
Copyright (c) 1988 by Cer-Comp Ltd

Screen Display Fonts

Window Master supports up to 54 different character sizes on the screen with 5 different character styles. You can have Bold, Italic, Underlined, Super-Script, Sub-script or Plain character styles or any combination of them in any character size. You can also change the text color and background at any time to get really colorful displays.

Fully Basic Compatible

Window Master is fully compatible with Enhanced Color Disk basic with over 50 Commands & functions added to fully support the Point & Click Window System. Window Master does not take any memory away from Basic, so you still have all the Basic Program memory available.

Hi-Resolution Displays

Window Master uses the full potential of the Color Computer 3 display by using the 225 vertical resolution display modes instead of the 192 or 200 resolution modes like most other programs. It uses either the 320/16 color mode or the 640/4 color display to give you the best display resolution possible, and can be switched to either mode at any time.

Window Master Features

Multiple Windows

Window Master supports multiple window displays with up to a maximum of 31 windows on the screen. Overlapping windows are supported, and any window can be made active or brought to the top of the screen. Windows can be picked up and moved anywhere on the screen with the mouse. There are 6 different Window styles to choose from and the window text, border and background color is selectable.

Pull Down Menus

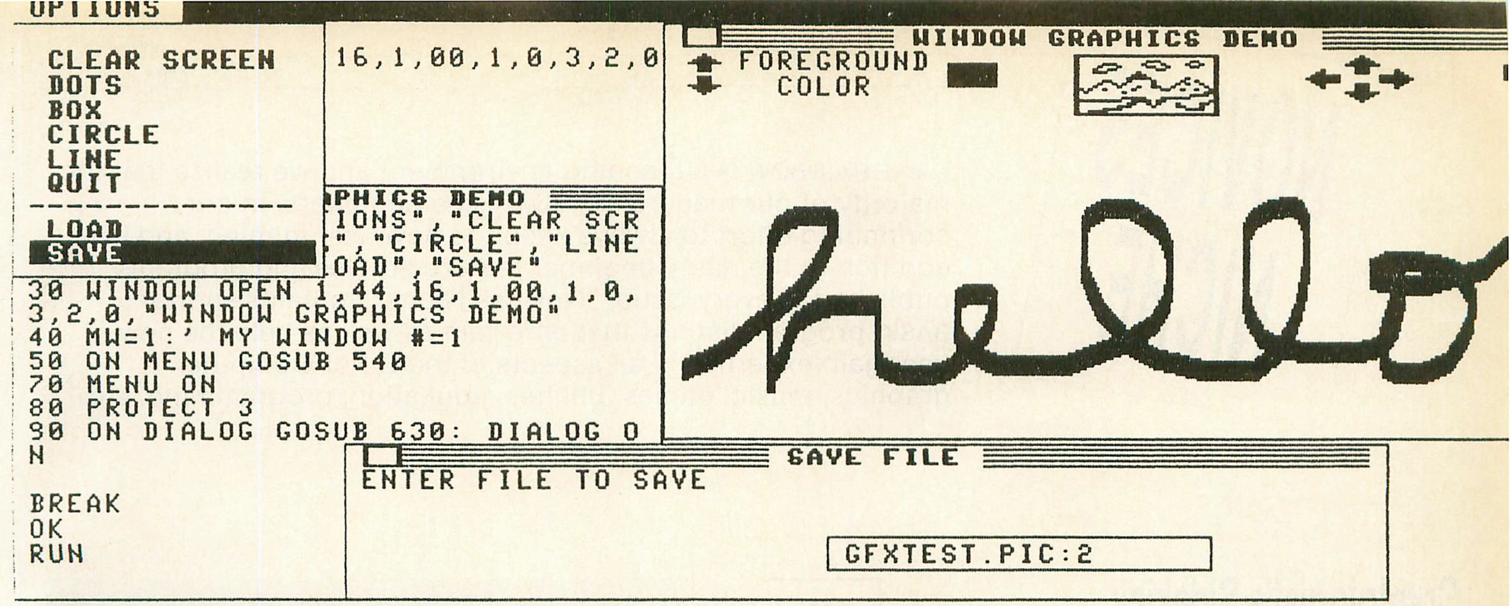
Menus are completely programmable with up to 16 menus available. They can be added or deleted at any time in a program. Menu items can be enabled, disabled, checked or cleared easily under program control. Menu selection is automatically handled by Window Master & all you have to do is read a function variable to find out which menu was selected.

Buttons, Icons & Edit Fields

Each Window can have up to 128 buttons, Icons or Edit fields active, if you can fit that many. Buttons, Icons and Edit field selection is handled automatically by Window Master when the mouse is clicked on one. All you have to do is read a Dialog function to find out which Button, Icon, or Edit field was selected, its very simple.

Mouse & Keyboard Functions

Window Master automatically handles the Mouse pointer movement, display and button clicks. It will tell you the current screen coordinate, the local window coordinate, window number the mouse is in, the number of times the button was pressed, which window number it was clicked in and more. The Keyboard is completely buffered, and supports up to 80 programmable Function keys that can contain any kind of information or command sequences you can imagine. You can load and save function key sets at any time. So, you can have special sets of function keys for different tasks. The "Ctrl" key is supported so that you have a full control code keyboard available.



```
16,1,00,1,0,3,2,0
```

```
PHICS DEMO
IONS","CLEAR SCR
","CIRCLE","LINE
OAD","SAVE"
30 WINDOW OPEN 1,44,16,1,00,1,0,
3,2,0,"WINDOW GRAPHICS DEMO"
40 MW=1:' MY WINDOW #=1
50 ON MENU GOSUB 540
70 MENU ON
80 PROTECT 3
90 ON DIALOG GOSUB 630: DIALOG O
N

BREAK
OK
RUN
```

ENTER FILE TO SAVE

GFXTEST.PIC:2

Mixed Text & Graphics

Window Master fully supports both Text & Graphics displays and even has a Graphics Pen that can be used with HLINE, HCIRCLE, HSET and more. You can change the Pen width & depth and turn it on or off with simple commands. We also added Enhanced Graphics Attributes that allow graphics statements to use And, Or, Xor and Copy modes to display graphic information. With the Graphics enhancements added by Window Master, you could write a "COCOMAX" type program in Basic! In fact we provide a small graphics demo program written in Basic.

Event Processing

Window Master adds a powerful new programming feature to Basic that enables you to do "Real Time" Programming in Basic. It's called Event Trapping, and it allows a program to detect and respond to certain "events" as they occur. You can trap Dialog activity, Time passage, Menu Selections, Keyboard activity and Mouse Activity with simple On Gosub statements, and when the specified event occurs, program control is automatically routed to the event handling routine, just like a Basic Gosub. After servicing the event, the sub-routine executes a Return statement and the program resumes execution at the statement where the event occured.

Enhanced Editing Features

Window Master adds an enhanced editor to Basic that allows you to see what you edit. It allows you to insert & delete by character or word, move left or right a word or character at a time, move to begin or end of line, toggle automatic insert on/off or just type over to replace characters. The editor can also recall the last line entered or edited with a single key stroke. You can even change the line number in line to copy it to a new location in the program.

Window Master Applications

Window Master pushs the Color Computer 3 far beyond its normal capabilities, into the world of a "User Friendly" operating enviornment. We are already planning several new programs for use with Window Master. So you don't have to worry about having to write all your own programs. And don't forget that many existing Basic and M.L. programs will run under Window Master with little or no changes. The Possibilities for Application programs are endless: Spread Sheets, Word Processing, Communications, Education, Games, Graphic Design, Desk Top Publishing and on and on.

Hardware Requirements

Window Master requires 512K of memory, at least 1 Disk Drive, a Hi-Res Joystick Interface and a Mouse or Joystick.

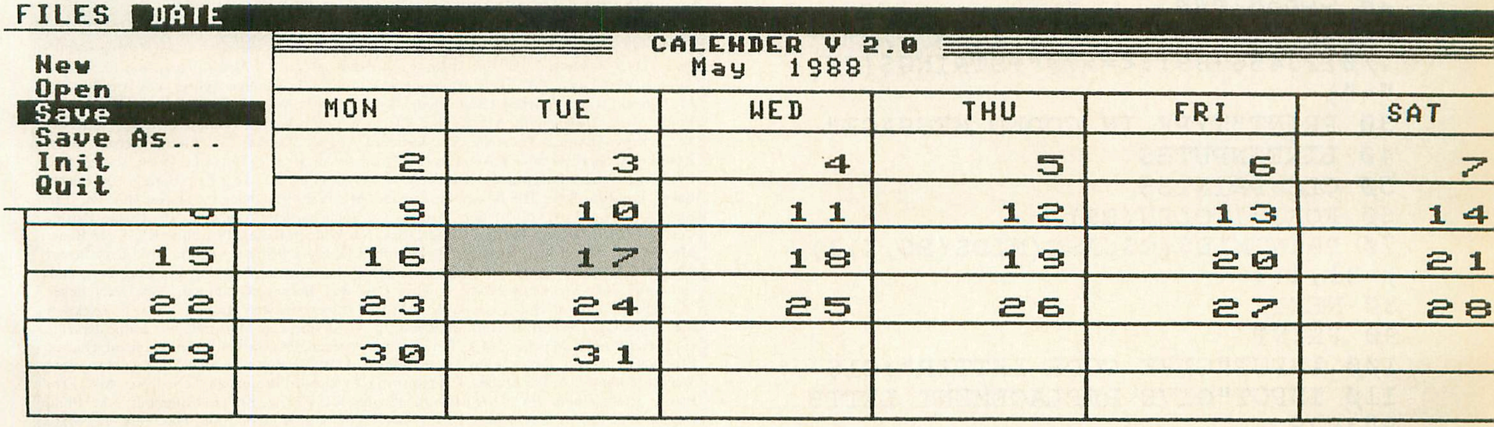
Technical Assistance

If you run into difficulty trying to use some of Window Master's features, we will be happy to assist you in any way possible. You can write to us at the address below or call us between 10am and 2pm Pacific Standard Time for a more timely response. Sorry, no collect calls will be accepted.

Ordering Information

To order WINDOW MASTER by mail, send check or money order for $69.95, plus $3.00 for shipping & handling to the address below. To order by VISA, MASTERCARD or COD call us at (702)-452-0632
(Monday thru Saturday, 8am to 5pm PST)

CER-COMP Ltd.
5566 Ricochet Avenue
Las Vegas, Nevada 89110
(702)-452-0632



CALENDER V 2.0
May 1988

	MON	TUE	WED	THU	FRI	SAT
	2	3	4	5	6	7
	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Call for availability of 128K version!

NOVICES NICHE

THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind, and in addition to the many beginner feature articles and programs published in every issue, "Novices Niche" contains shorter BASIC program listings that entertain as well as help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

Cryptologist's Sidekick

16K
ECB

By Donald Kyllo

When I started working on the encrypted message in the Cryptogram Contest, I took out a piece of paper and began using substitution. Then it occurred to me that I could write a program that would do this automatically — thus *CryptAid* was born. Just run the program and type in the coded message.

CryptAid creates a series of blanks, which will be filled in as you try different letter combinations. It asks you to enter an encoded letter and then the letter you think the encoded letter is substituting for. For example, if the encoded message is MPTYJ NU MPTYJERDY, the program creates this: ----- -- ---------. Then it asks you to "give code letter." You might start with the first code letter, M. The program would then ask you to give it a substitute letter — try N. The letter N would then show up in every occurrence of the letter M: N---- -- N--------.

If you change your mind about that substitution, you can try another letter for M. (N is the correct substitution for M, by the way. This three-word cryptogram is a movie title.) Continue substituting letters until you decode the message. You'll find that solving a cryptogram on computer is a lot easier than solving one on paper.

The listing: `CRYPTAID`

```
10 CLEAR1000
20 C$=" !"+CHR$(34)+"#$%&'()*+,-
./0123456789:;<=>?@"+STRING$(26,
"-")
30 PRINT"TYPE IN CODED MESSAGE"
40 LINEINPUTB$
50 CLS:PRINTB$
60 FORI=1TOLEN(B$)
70 PRINTMID$(C$,ASC(MID$(B$,I,1)
)-31,1);
80 NEXT
90 PRINT
100 INPUT"GIVE CODE LETTER";C1$
110 INPUT"GIVE REPLACEMENT LETTE
R";C2$
120 MID$(C$,ASC(C1$)-31,1)=C2$
130 GOTO50
```

Novices Niche Addendum

Cryptogram Contest Results

The solution to the cryptogram contest that appeared in the April '88 issue is as follows:

Follow THE RAINBOW to a CoCo "pot of gold." THE RAINBOW is the only magazine just for your Tandy CoCo 1, 2 and 3 and will meet your computing needs for business and pleasure. Be sure to tune in next month for our printer issue.

The notice read, "In case of a tie, we will hold a drawing." What an understatement! We had a 585-way tie. Any Trekkie will know what we mean when we say we had "Tribble" trouble. The responses never stopped multiplying!

Lonnie Falk did the honors of wading into the sea of entries and netting the winner — and that winner is Richard Osborne of Nickelsville, Virginia. Congratulations, Richard, on winning *The Third Rainbow Book of Adventures* and its companion disk! The rest of you entrants take heart — more contests (more difficult ones, too) are coming your way. We wish we could give every successful cryptologist a copy of the *Adventures* book, but we can't, so we're offering the consolation of seeing your name in print (as promised in the May issue, *before* we knew we'd get 585 entries — but, hey, we keep our promises!):

Betty Abrecht, Elloree, SC; Jon Adamowicz, Paramus, NJ; Bill Adams, Pasadena, TX; Robert Adams, West Lawn, PA; Ellen Aftamonow, Milford, CT; Roselyn Agosto, Los Angeles, CA; M. Allaston, Tracy, Quebec; Leon Albin, Glen Echo, MD; Warren Albright, Grand Rapids, MI; Frank Allen, Arkadelphia, AR; Robbie Allen, Charlestown, NH; Tommy Allen, Jr., Anderson, SC; Jeffrey Allmond, Pocatello, ID; Kathleen Alston, Madera, CA; John Anderson, Baton Rouge, LA; Sandi Arhart, Mason City, IA; Dean Arnall, Uvalde, TX; Mike Arvan, Youngstown, OH; Bryan Ayriss, Baldwin, MI; Sol Azar, N. Massapequa, NY; Tom Bair, Boring, OR; Eugene Baker, Greston, B.C.; Jeff Baker, Prudenville, MI; Frank Baldwin, Jr., Drexel Hill, PA; Tom Baleno, Bolton, MA; Gilbert Barr, Austin, TX; John Bartlett, Penacook, NH; Donna Bartley, Cerritos, CA; Margaret Bartley, Clifton Park, NJ; William Batten, Pittsburg, KS; Keith Bauer, Menominee, MI; Robert Beasley, Ft. Lupton, CO; Clem Bedard, Victoria, BC; Gary Beeley, Tucker, GA; Darrel Behrmann, Napoleon, OH; Robert Benson, Niceville, FL; Chris Bergerson, Getzville, NY; Steven Berman, Encino, CA; Ray Berney, Okanogan, WA; Karl Beyer, Marengo,IL; Conrad Biller, Louisville, KY; Paul Bisnett, Sackets Harbor, NY; Ivan Blackwell; P.B. Blackwell, Decatur, IL; Edward Blend, Jr., Victorville, CA; Martin Boisen, Carpentersville, IL; David Bonito, Mashpee, MA; Tony Boring, Armagh, PA; Gaetan Bosse, Montreal, Quebec; Eric Bower, Ossian, IN; Greg Boyko, Bonning, CA; Walter Bowman, Radcliff, KY; Mark Boyt, Warner Robins, GA; Pat Brands, Chatsworth, CA; Richard Bresnahan, Leominster, MA; Errol Brister, Philadelphia, PA; Alfred Brown, Racine, WI; Charles Brown, Columbus, NM; Philip Brown, San Rafael, CA; James Bruce, Ackerman, MS; Robert Bruhl, Oak Park, IL; Matia Bryson, Woodstock, GA; Jason Bucata, Ferndale, MI; Christopher Buchanan, Maroa, IL; Harry Buchanan, Maroa, IL; Tracy Buchanan, Maroa, IL; John Bullard, Madison, FL; Carl Burgess, Washington, D.C.; Ron and Nancy Burgin; William Bushby, Hershey, PA; Kenneth Byram, Ft. 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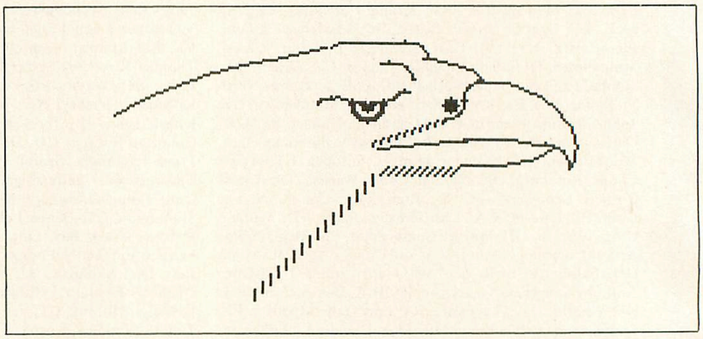
Graphics

Here Eagles Dare

16K
ECB

By Steve Caldwell

Display your patriotism with this short program, which draws an American eagle on the PMODE 4 screen. *From Steve Caldwell, Stonewell Ent., P.O. Box 9357, Canton, OH 44711.*



The listing: EAGLE

```
10 PMODE4,1:SCREEN1,1:PCLS(1)
20 CIRCLE(128,96),7,2,1,.95,.55:
CIRCLE(128,96),3,2,1,.999,.50:CI
RCLE(128,96),6,2,1,.98,.53:CIRCL
E(128,88),16,2,.5,.15,.40:PAINT(
128,97),2,2:CIRCLE(114,96),6,2,.
5,.55,.80:CIRCLE(142,93),4,2,.8,
.50,.85
30 CIRCLE(170,112),38,2,.7,.75,.
05:CIRCLE(196,120),10,2,1,.75,.9
99:CIRCLE(176,120),30,2,.4,.70,.
87:LINE(169,109)-(132,113),PRESE
T:CIRCLE(172,108),30,2,.4,.07,.3
0
40 CIRCLE(172,94),8,2,1,.50,.83:
CIRCLE(158,94),8,2,1,.99,.25:CIR
CLE(160,96),3,2:PAINT(160,96),2,
2
50 CIRCLE(146,105),40,2,.7,.78,.
87:CIRCLE(142,78),10,2,.77,.70,.
0:CIRCLE(136,86),10,2,.77,.70,.0
60 LINE(138,72)-(120,72),PRESET:
CIRCLE(120,80),10,2,.9,.65,.75:C
IRCLE(180,140),180,2,.4,.60,.70
70 FORX=163TO136STEP-3:LINE(X,12
0)-(X-3,123),PRESET:NEXT:X=130:F
ORY=123TO170STEP3:LINE(X,Y)-(X,Y
+4),PRESET:X=X-3:NEXT
80 X=158:FORY=101TO111STEP1.1:LI
NE(X,Y)-(X-1,Y+2),PRESET:X=X-3:N
EXT
200 GOTO200
```

Utilities

ML Addresses

16K
Disk

By Bill Bernico

This program scans a disk directory for ML files and lists only these files and their start, end and EXEC addresses. The program is self-explanatory and will work on a CoCo 2 or CoCo 3 in 32, 40 or 80 columns.

The listing: SCRNLIST

```
1 CLEAR1500:DIMZ(68):H$="#####":
CLS:PRINT"INSERT DISK AND HIT AN
Y KEY FOR START,  END & EXEC ADD
RESSES OF  BINARY FILES":EXEC445
39:CLS:PRINT"FILENAME/EXT  START
  END   EXEC":PRINT:DSKI$0,17,2,
A$,B$
2 G$=LEFT$(A$,68):FORI=1TO68:Z(I
-1)=ASC(MID$(G$,I,1)):NEXTI:FORX
=3TO11:DSKI$0,17,X,AA$,BB$:AA$=A
A$+LEFT$(BB$,120):FORN=0TO7:F$=M
ID$(AA$,N*32+1,8):E$=MID$(AA$,N*
32+9,3):Z=ASC(MID$(AA$,N*32+14,1
)):Y=Z:C$=MID$(AA$,N*32+12,1):D$
=MID$(AA$,N*32+13,1)
3 IFLEFT$(F$,1)=CHR$(0)THEN9
4 IFLEFT$(F$,1)=CHR$(255)THEN10
5 W=ASC(D$)AND 1:FORI=1TO68
6 IFZ(Z)<128THENZ=Z(Z):NEXTI
7 GOTO11
8 IFASC(C$)=2THENPRINTF$;"/BIN
";:PRINTUSINGH$;V;:PRINT",";:PRI
NTUSINGH$;U;:PRINT",";:PRINTUSIN
GH$;T
9 NEXTN,X
10 PRINT:END
11 LG=Z(Z):S=LG AND 31:R=Z:Q=ASC
(MID$(AA$,N*32+16,1))
12 IFY<34THENP=INT(Y/2)ELSEP=INT
(Y/2)+1
```

```
13 M=1+(Y AND 1)*9:DSKI$0,P,M,A$
,B$:V=ASC(MID$(A$,4,1))*256+ASC(
MID$(A$,5,1))
14 U=V+ASC(MID$(A$,2,1))*256+ASC
(MID$(A$,3,1))-1
15 IFR<34THENP=INT(R/2)ELSEP=INT
(R/2)+1
16 M=(R AND 1)*9+S:DSKI$0,P,M,A$
,B$:A$=A$+LEFT$(B$,127):T=ASC(MI
D$(A$,Q-1,1))*256+ASC(MID$(A$,Q,
1)):GOTO8
```

CoCo 3 Green Screen Blues

CoCo 3

By Charles F. Phillips

Picture this: After months of anticipation I finally bought a CoCo 3, connected it to my green screen monochrome monitor (I couldn't yet justify the price of a CM-8 to my wife), powered up and saw . . . a screen full of garbage! To those of you who use a color monitor adapter with your CoCo 2, this would be no surprise. To those of us who use a monochrome adapter, this is a near-fatal shock!

To make life with CoCo 3 and a monochrome monitor more bearable, I borrowed some hints and pokes from THE RAINBOW and wrote this menu-driven program. *Mono3* kills the color burst and sets the PALETTEs to a white foreground with black background.

The menu gives you seven options, allowing you to set your screen to black on green or green on black in 32, 40 or 80 columns. Lines 40 through 110 provide the menu; lines 120 through 190 are a keyboard input routine. Lines 230 through 280 set the width, kill the color burst, set the PALETTEs and go to the main menu so that you can try out all the options. Option 7, End Program, clears the menu from the screen and wipes the memory to prevent interference with the next program. Just break out of the program if you want to leave the settings in effect.

If the 80-column, green on black option looks strange, try increasing the brightness a bit. If you have an amber monitor, simply edit lines 50 through 100, swapping the word amber for green.

The listing: MONO3

```
5   '  MONOCHROME COCO3
10  '  BY CHARLES F. PHILLIPS
15  '  11 GASTON PLACE
20  '  HAVELOCK, N.C. 28532
25  '
30 WIDTH32:POKE&HE033,16:PALETTE
12,63:PALETTE13,0:CLS
40 PRINT:PRINT"    SELECT A STYLE
 OF DISPLAY"
50 PRINT:PRINT"1. 32 COLUMNS, GR
EEN ON BLACK"
60 PRINT"2. 32 COLUMNS, BLACK ON
 GREEN"
70 PRINT"3. 40 COLUMNS, GREEN ON
 BLACK"
80 PRINT"4. 40 COLUMNS, BLACK ON
 GREEN"
90 PRINT"5. 80 COLUMNS, GREEN ON
 BLACK"
100 PRINT"6. 80 COLUMNS, BLACK O
N GREEN"
110 PRINT"7. END PROGRAM":PRINT
120 INPUT C$
130 IF C$="1" THEN 230
140 IF C$="2" THEN 240
150 IF C$="3" THEN 250
160 IF C$="4" THEN 260
170 IF C$="5" THEN 270
180 IF C$="6" THEN 280
190 IF C$="7" THEN 290 ELSE 40
230 GOTO 30
240 WIDTH32:POKE&HE033,16:PALETT
E12,0:PALETTE13,63:CLS:GOTO40
250 WIDTH40:POKE&HE03C,19:PALETT
E0,0:PALETTE8,63:CLS1:GOTO40
260 WIDTH40:POKE&HE03C,19:PALETT
E0,63:PALETTE8,0:CLS5:GOTO40
270 WIDTH80:POKE&HE045,19:PALETT
E0,0:PALETTE8,63:CLS1:GOTO40
280 WIDTH80:POKE&HE045,19:PALETT
E0,63:PALETTE8,0:CLS5:GOTO40
290 CLS:NEW
```

Game

Guess Who

4K

By Keiran Kenny

Gather your guests around the CoCo and let them guess the names of well-known people, places or events from letters scattered randomly over the screen. You are the Quiz Master who can bring enlightenment from confusion by pressing the space bar to reveal the answer.

The display time can be varied from 1 (fairly short) to 9 (long). You can enter your own choice of categories and names in the DATA lines beginning with Line 220, but you will need many more than my few examples to make the game interesting. The first DATA item is the category (like "Presidents" in Line 220). Enter as many names and DATA lines as you want for each category, but note that each DATA category must end with "", and also that the very last DATA entry must read END (as in Line 1000).

The listing: GUESSWHO

```
0 'GUESSWHO' BY KEIRAN KENNY,
   SYDNEY, 1987
10 CLS:GOTO170
```

```
20 READT$:IFT$="END"THEN150ELSEP
RINT@240-LEN(T$)/2,T$
30 PRINT@458,"PRESS <ENTER>"
40 K$=INKEY$:IFK$<>CHR$(13)THEN4
0ELSECLS
50 READA$:IFA$=""THENCLS:GOTO20
60 FORT=1TOLEN(A$)
70 IFINKEY$=CHR$(32)THEN130
80 P=1151+RND(256)
90 IFPEEK(P)<>96THEN80
100 IFMID$(A$,T,1)=CHR$(32)THENP
OKEP,96ELSEPOKEP,ASC(MID$(A$,T,1
))
110 NEXT
120 FORD=1TODL*100:IFINKEY$=CHR$
(32)THEN130ELSENEXT:CLS:GOTO60
130 CLS:PRINT@240-LEN(A$)/2,A$:G
OTO30
140 GOTO140
150 CLS:PRINT@237,T$
160 GOTO160
170 PRINT@104,"<<<GUESS WHO>>>"
180 PRINT@193,"BY KEIRAN KENNY,
SYDNEY, 1987."
190 PRINT@289,"DISPLAY TIME (1-9
):";:INPUTDL
200 IFDL<1ORDL>9THENPRINT@289,""
:GOTO190
210 CLS:GOTO20
220 DATA PRESIDENTS,GEORGE WASHI
NGTON,KENNEDY,MADISON,JOHNSON,RO
NALD REAGAN,""
230 DATA FILM STARS,MARYLIN MONR
OE,BILL COSBY,JOAN COLLINS,AUDRE
Y HEPBURN,""
240 DATA CITIES,COPENHAGEN,BUENO
S AIRES,JAKARTA,MONTREAL,MELBOUR
NE,RIO DI JANIERO,""
1000 DATA END
```

Heart & Head

Looking for a Heartbeat

16K
ECB

By Wilmer B. Maxwell

Did you know that your heart beats more than 100,000 times each day — about 36 million times a year?

Pulse Beat counts your pulse rate. When you are resting and relaxed, the pulse beat rate should be in the range of 60 to 75. Keep in mind that a child's pulse rate tends to be faster than an adult's.

Just type in, save, load and run the program and follow the onscreen prompts to get an estimate of your pulse rate.

The listing: PULSBEAT

```
100 REM: CLOAD"PULSBEAT"
110 CLS4:L=227
120 FOR X=1 TO 9
130 H=32:READ T$
140 FOR T=1TO6:SOUND2,1
150 PRINT@L,CHR$(191);:GOSUB440
160 PRINT@L,T$;:GOSUB440
170 IFX=1ORX=9THENH=H+32:IFH=>64
THENH=64
180 IFX=2ORX=8THENH=H+32:IFH=>16
0THENH=160
190 IFX=3ORX=7THENH=H+32:IFH=>19
2THENH=192
200 IFX=4ORX=6THENH=H+32:IFH=>16
0THENH=160
210 IFX=5THENH=H+32:IFH=>128THEN
H=128
220 NEXT T
230 L=L+3:NEXT X
240 FOR D=1TO1800:NEXT D
250 DATA P,U,L,S,E,B,E,A,T
260 CLS4:PRINT@32,"   THIS PROGR
AM RECORDS YOUR"
270 PRINT"   PULSE IN BEATS PER
MINUTE.";:PRINT
280 PRINT" WITH YOUR LEFT HAND,
FIND YOUR"
290 PRINT"PULSE ON THE RIGHT SID
E OF YOUR"
300 PRINT"NECK, DIRECTLY UNDER Y
OUR JAW..":PRINT
310 PRINT" WITH YOUR RIGHT HAND,
 TAP ANY"
320 PRINT"KEY EVERY TIME YOUR PU
LSE BEATS!"
330 PB=0:PRINT"          start any
 time "
340 A$=INKEY$:IF A$="" THEN 340
ELSE 350
350 TIMER=0:PB=1:SOUND 200,1:GOT
O 380
360 A$=INKEY$:IF A$=""THEN 360 E
LSE 370
370 PB=PB+1:SOUND 180,1
```

```
380 SV=TIMER:IF SV=>505 THEN 390
 ELSE 360
390 PRINT@416,"     YOUR PULSE RA
TE IS";PB*6
400 SOUND 150,8:FOR P=1TO1000:NE
XT P
410 PRINT"          PLAY AGAIN <Y/N >
?"
420 A$=INKEY$:IFA$=""THEN 420
430 IF A$="Y" GOTO 260 ELSE 500
440 FOR D=1TO50:NEXT D
450 PRINT@L-H,CHR$(128);:PRINT@L
+H,CHR$(128);
460 IFX=4THEN PRINT@428,CHR$(128
);:PRINT@460,CHR$(128);
470 IFX=5THEN PRINT@399,CHR$(128
);:PRINT@431,CHR$(128);:PRINT@46
3,CHR$(128);:PRINT@495,CHR$(179)
;
480 IFX=6THEN PRINT@434,CHR$(128
);:PRINT@466,CHR$(128);
490 RETURN
500 CLS:END
510 REM:BY W.MAXWELL,CARLISLE,PA
```

May the Force Be with You?

CoCo 3

By Travis Halbrook

Not too long ago I saw a TV advertisement for a game that was supposed to increase a person's psychic ability. The game had four lights that came on at random, and the object was to guess which light would come on next. Users said they experienced increased intuition by playing the game. I modeled my program, *Psychic Intuition Developer* (*PID*), after this game.

When you load and run *PID*, you will see four boxes on the screen, numbered 1 through 4. You are to guess (with psychic intuition) which box will light up by pressing the appropriate number key. The computer will tell you if you are right or wrong. Every correct guess adds a point to your score.

There are 24 guesses in a game; the statistical norm for correct guesses is six. If you routinely rate scores of nine or more, perhaps the force is with you!

The listing: PSYCHIC

```
0 '********************************
   *       PSYCHIC INTUITION       *
   *           DEVELOPER           *
   *     "BY TRAVIS HALBROOK"      *
   ********************************
10 WIDTH32:X=RND(-TIMER):RGB:CLS
0:FOR C=1 TO 4:L$(C)=STRING$(5,1
28+16*(C-1)+15):NEXT C:FOR Y=193
 TO 321 STEP 32:FOR C=0 TO 3:PRI
NT@Y+(C*8),L$(C+1);:NEXTC:NEXTY:
C=1:FOR A=259 TO 290 STEP 8:POKE
 1024+A,C+48:C=C+1:NEXT A:FOR T=
1 TO 20:L=RND(4)-1
20 S=RND(255):PALETTE L,63:SOUND
 S,1:RGB:NEXT T:A$="intuition"+C
HR$(128)+"developer"+CHR$(128):F
OR B=127 TO 102 STEP-1:PRINT@B,L
EFT$(A$,127-B);:FOR DLAY=1 TO 30
:NEXT DLAY:NEXT B
30 FOR T=1 TO 24:PRINT@458,"choo
se"+CHR$(128)+"one";:L=RND(4)-1:
W=L+1
40 A$=INKEY$:IF A$="" THEN 40
50 A=VAL(A$):IF A<1 OR A>4 THEN
40
60 POKE 1518,A+48:PALETTE L,63:I
F A=W THEN GOSUB 110 ELSE GOSUB
130
70 NEXT T
80 PRINT@427,"YOU GOT ";SC;:PRIN
T@457,"OUT OF 24 RIGHT";:PRINT@4
88,"PLAY AGAIN  (Y/N)";
90 A$=INKEY$:IF A$<>"Y" AND A$<>
"N" THEN 90
100 IF A$="Y" THEN 160 ELSE IF A
$="N" THEN END
110 'RIGHT SUBROUTINE
120 SOUND 150,5:PRINT@396,"right
";:SC=SC+1:PRINT@10,"score="SC;:
FOR DLAY=1 TO 500:NEXT DLAY:PRIN
T@396,STRING$(5,128);:RGB:POKE 1
518,128:RETURN
130 'WRONG SUBROUTINE
140 PRINT@396,"wrong";:SOUND 1,5
:FOR DLAY=1 TO 500:NEXT DLAY:PRI
NT@396,STRING$(6,128);:RGB:POKE
1518,128:RETURN
150 'PLAY AGAIN
160 PRINT@416,STRING$(95,128);:P
OKE 1535,128:PRINT@0,STRING$(32,
128);:CLEAR:GOTO 30
```

Submissions to "Novices Niche" are welcome from everyone. We like to run a variety of short programs that can be typed in at one sitting and are useful, educational and fun. Keep in mind, although the short programs are limited in scope, many novice programmers find it enjoyable and quite educational to improve the software written by others.

Program submissions must be on tape or disk. We're sorry, but we cannot key in program listings. All programs should be supported by some editorial commentary, explaining how the program works. If your submission is accepted for publication, the payment rate will be established and agreed upon prior to publication.

A tutorial to teach students the months of the year

"Thirty Days Hath September"

By Joseph Kolar
Rainbow Contributing Editor

A teacher at Lakeview School in Hernando, Fla., wondered if I could make up a program to teach students the names and sequence of the months of the year and give them a little workout at the keyboard, copying the months from the screen. A challenge is a challenge; overjoyed at having a specific problem to attack, I snapped at the opportunity to show off my skills.

The first thing to be done was a simple expedient. Our old faithful *Race* program of previous tutorials, which should be in your library, was chosen to give the program some graphics enhancements. Load `Race`, type `RENUM 500,0,10)` and run; type `499 GOTO499` then `LIST`.

We moved our graphic out of the way by renumbering it and checking it out. We added a perpetual loop in front of it so that, unless we deliberately intend to change it, our graphic is out of harm's way. We listed and noted the last line. We can add subroutines beginning at Line 1000 and bypass the graphic. Our creation will be developed between lines 0 and 499 and from 1000 onward.

In Line 0 type `12MONTHS`. For the time being, I will hold the space between Lines 10 and 19 for the student's name. Line 20 begins the program proper.

The plan is that each month will be enclosed in a string variable from `A$` through `L$`. Copy Line 20 from listing `12MONTHS` and run. You should get a blank screen. So far, nothing has been written. We ran the line to see if CoCo picked up any SN, TM or other errors that are commonly made and a nuisance to locate. We will verify for correct spelling when we print the months on the screen.

Type and run `30 PRINT:PRINT @7,"MONTHS OF THE YEAR"`. What is wrong with this line? The `PRINT` doesn't print an empty top row. The `PRINT@7` prints at Location 7 on the text screen, which is on the top row. Fuzzy thinking on my part. Spaces 0 through 31 are on the top row. Since 32+7=39, seven spaces from the left margin will be on the second, or target, row. Type and run `31 PRINT@39,"M"`.The `M` falls directly below the `M` in `MONTH`. Delete Line 31.

The line I was looking for was `30 PRINT@39,"MONTHS OF THE YEAR"`.

This is not to impute that the other construction is no good. So long as the mission is accomplished and you are satisfied with the result, then rest on your laurels. Who cares what your listing looks like? The students will never suspect that you have a sloppy construction.

We plan to skip a line and print two columns. Copy Line 40. The actual, repeating format for each entry is a repetition of `" 1. "X$,`, where `X$`, is the month in Line 20 that matches the number. Double-digit numbers will not have a blank space after the opening quote.

You may prefer to present the first and second months, side by side, paired on the top row and continue in this format. Rewrite the line, if you find that list more appealing. Double-check the spelling. Note that a comma separates each entry and locates the next column. We are into the meat of the program.

The idea is to do the months in sequence. We will require a `FOR-NEXT` loop, `FOR X=1 TO 12`. It seemed logical to begin the loop next.

`50 PRINT:FOR X=1 TO 2`. This line supports only January and February. The plan is to make a workable two-month program. Then, if all goes well, we will expand it to a full year.

Copy Line 60 from the listing. This line orders CoCo to go to Line 70 when `X=1` and hop over to Line 71 when `X=2`. Line 70 will settle January, and Line 71 will handle February.

Copy lines 70 and 71 from the listing. `LIST70`. Why use `LINEINPUT` instead of `INPUT`? It omitted the annoying question mark prompt. Within quotation marks and with a two-space indent, the keyboard operator, (high-class name for student), is to type in the first month. He is to refer to Month #1 in the table for proper selection and spelling. `X$` is what he types in. If he does this task correctly and it is exactly the same as `A$` in Line 20, CoCo is directed to Line 90. `C=C+1` counts how many months are successfully typed. Since it has to be all 12, this line is useless, but it doesn't cost anything.

After typing all 12 months, CoCo is told to clear the display, put on a fresh table and go to the next month. The only problem is that if the table is included in the loop, the true loop should be in front of Line 30.

`25 FOR X=1 TO 12`. We need to print the empty row in Line 50 for aesthetic value. Lop off the `FOR-NEXT` statement.

Enter `EDIT50`. Use the space bar to position the cursor over the colon, press `H` and `ENTER`. Run. If you spelled the months correctly a UL error popped up, suggesting more lines be created. In the event that the word was misspelled or the wrong word typed in, Line 70 directs CoCo to `GOSUB300` and then return.

Key in Line 300 from the listing. This is the boo-boo calculator, F=F+1, just in case we want the sum total of the bad spellings. A line is skipped. A message gives the bad news and returns. Note the unused variable, `N$`. Make a deliberate typing error to check this line out. If the student is a real klutz, after the third bad news report, the table will scroll up, up and away. We counted the number of attempts, `T`, to do a particular month. If `T=3`, give up, clear the screeen, reset `C` for a fresh start and begin from the beginning.

At this point, we put in Line 26, `26 T=0`, inside the loop to reset it to 0.

`24 C=0:F=0`. We are not likely to use these reset counters. When the program is recycled, Line 24 is the first line to be repeated after a successful run-through. Copy all lines from 72 through 81. Upon

---

Florida-based Joseph Kolar is a veteran writer and programmer who specializes in introducing beginners to the powers of the Color Computer.

completion, CoCo jumps back to the beginning.

Copy lines 90 and 95. After December is typed in correctly, we zoom over to our graphic. The three-line text will be changed:

```
530 PRINTTAB(11)"GOOD WORK,"
550 PRINTTAB(12)N$"!"
560 PRINT:PRINTTAB(6)"YOU
HAVE ALL TWELVE:"PRINTTAB(8)
"MONTHS CORRECTLY."
```

This is great, but we are hung up with no end in sight. Notice the exclamation point. The name, `N$`, should go there. It is high time to give the student an opportunity to personalize his or her work.

Key in lines 10 to 14. Line 10 is familiar, creating five blank rows. A name is requested. Line 12 gives instructions. I didn't know how to add `PRESS <ENTER>` to Line 12. First, I located the message so that it would be tastefully located and visible even though it came after the Type Prompt. Then I found that the seventh row began at 192 and printed nothing there but reserved the line. Now, the `LINEINPUT` would fall where it was expected. Line 14 moved us along with a time-waster. The name was printed, stored in memory and CoCo was told to keep working.

Running through all the colors over and over again in effect hangs us up. We decided to use just three colors. The first one would race around the text. When the second color came up, we went to a subroutine at Line 1000 that inquires whether or not we want to repeat the exercise. When the third color comes up we wipe out the window, all except the name, and then jump back for a new exercise, bypassing the name routine.

```
570 FOR C=3TO7 STEP2
575 IF C=5 GOSUB1000
576 IF C=7 GOTO790
780 NEXTC:IF C=7 GOTO 790
```

This breaks out of the maddening loop.

For some reason or other I have the same instruction twice: `IF C=7 GOTO790`. What happened was that I destroyed this program and had to redo it from memory.

Type and enter the following:

```
900 NEXTC: FOR Z=1TO1000:
NEXT:CLS:GOTO20
```

Copy lines 1000 through 1050 from the listing:

```
890 SCREEN0,1
EDIT1000 <I><SCREEN0,1:>
```

These last two changes show us that we can change the color of our window without disturbing the overlying graphics. It also adds a bit of interest.

Mask Line 890 after the first statement. This line leaves the name on the screen till the last second. Line 1012 ended with a proper question mark. The question mark is inappropriate only when the name is showing. Line 885 prints the name in the exact location and blanks out the question mark.

Compare initial location positions of Line 1012, (197+64=261) and Line 885, (264). The white border ends eight spaces to the left of the first letter of the name. The purple border ends five spaces to the left of the first letter of the name. We considered the first letter of the name as our reference point in doping out these two lines.

Line 1000 turns the screen to the alternate color. Line 1005 blanks out the top line, `GOOD WORK,`. Line 1010 prints a question. Note that the `PRINT@` location is in the sixth column, at the left

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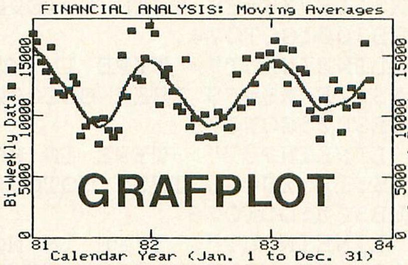

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Area Code changes to (508) after July 16th

border of the text window. If you want to see where it is changed, change Line *1010 to* `196` temporarily and run. Lines 1011 through 1014 all begin in the same column. The added value `+32` to each succeeding line drops the location down a row while still remaining in the proper column. The spaces after the opening quote were designed to obliterate the previously existing text.

If you look carefully, you will see a remnant on the screen. Do you see the period left after Line 1020 does its work? It is about five spaces after `NO` on the screen. Enter `EDIT1020` and type `18`; press the space bar into the blank area after text. Press I and the space bar, enter and run. We added just one space to do the job. If we had added them indiscriminately, we might have crashed through the right border. If we had left off the semicolon, we would have gone clear to the end of the row, ruining our carefully crafted graphic.

Line 1005 begins at 170. This location was before the `GOOD WORK,` line. Enough blank spaces were set to blank out the line. What would happen if I used 197-32 instead of 170? Think! Now, try it and see!

Lines 1014 and 1020 could have easily been combined into a single line. Mask lines 1014 and 1020. This leaves `MONTHS CORRECTLY.` exposed in the text window.

Enter and run `1015 PRINT@197+128"12345678YES/NO12345678";`. Pretend the numerals are blank spaces. That pesky dot is under one of the numbers after `NO`. You can see that the eight numbers on each side center the text correctly. This technique is a lot of work but it is a good tutorial device to help you in locating the exact starting position.

Line 1015 begins printing at `197+128=(325)`. Add the three blank spaces to the left of `MONT` and you find where the `M` is situated `(328)`. Five blank spaces follow the opening quote, and the centered text follows. We need six blank spaces to cover the pesky dot and then we can close out, allowing us to finalize the line:

```
1015 PRINT328," YES/NO ";
```

You have three choices: Unmask lines 1014 and 1020 and mask Line 1015; leave it as it is; or leave Line 1015 unmasked, deleting lines 1014 and 1020.

Save `12MONTHS`.

You can see programming takes lots of planning. It takes a lot of trial and error before you and CoCo are of one mind. Lots of mistakes or poor logic add spice to the ultimate success. This tutorial was presented from my frame of reference, the sum total of my CoCo knowledge, and my faulty logic. Certainly there are other ways to approach each problem.

If you work along with me and at times say to yourself, "I would have done this in such and such a way. I know an easier way. Kolar isn't so smart," I congratulate you. You are doing your own thinking and imprinting your personality on your work. You are healthily skeptical of so-called experts and allow your creative side to assert itself. I hope you remain flexible in your approach to CoCo's quirks and develop your own bag of tricks. Make mistakes — and brag about them, for we all learn from mistakes. But go back to the keyboard for a creative session that will lead into the vast unknown.

Our next project will involve the opening frame of `12MONTHS`. With all the Lo-Res graphics under our belt, don't you think you could dress up the opening segment? Create something neat, in case I wander off onto some unrelated subject.

See you next month! ☐

73	11
81	118
650	186
780	239
900	244
END	47

The listing:

```
0 '<12MONTHS>
10 CLS: FOR X=1TO5:PRINT:NEXT
11 PRINT@258,"PRESS <ENTER>":PRI
NT@192,"";
12 LINEINPUT"  TYPE IN YOUR NAME
: ";N$
14 FOR Z=1 TO 500:NEXT
20 CLS:A$="JANUARY":B$="FEBRUARY
":C$="MARCH":D$="APRIL":E$="MAY"
:F$="JUNE":G$="JULY":H$="AUGUST"
:I$="SEPTEMBER":J$="OCTOBER":K$=
"NOVEMBER":L$="DECEMBER"
24 C=0:F=0
25 FOR X=1 TO 12
26 T=0
30 PRINT@39,"MONTHS OF THE YEAR"
40 PRINT:PRINT" 1. "A$," 7. "G$,
" 2. "B$," 8. "H$," 3. "C$," 9.
"I$," 4. "D$,"10. "J$," 5. "E$,"
11. "K$," 6. "F$,"12. "L$
50 PRINT
60 ON X GOTO70,71,72,73,74,75,76
,77,78,79,80,81
70 LINEINPUT"  TYPE IN MONTH 1.
";X$:IF X$=A$ THEN GOTO90 ELSE G
OSUB300:GOTO70
71 LINEINPUT"  TYPE IN MONTH 2.
";X$:IF X$=B$ THEN GOTO90 ELSE G
OSUB300:GOTO71
72 LINEINPUT"  TYPE IN MONTH 3.
";X$:IF X$=C$ THEN GOTO90 ELSE G
OSUB300:GOTO72
73 LINEINPUT"  TYPE IN MONTH 4.
";X$:IF X$=D$ THEN GOTO90 ELSE G
OSUB300:GOTO73
74 LINEINPUT"  TYPE IN MONTH 5.
";X$:IF X$=E$ THEN GOTO90 ELSE G
OSUB300:GOTO74
75 LINEINPUT"  TYPE IN MONTH 6.
";X$:IF X$=F$ THEN GOTO90 ELSE G
OSUB300:GOTO75
76 LINEINPUT"  TYPE IN MONTH 7.
";X$:IF X$=G$ THEN GOTO90 ELSE G
OSUB300:GOTO76
77 LINEINPUT"  TYPE IN MONTH 8.
";X$: IF X$=H$ THEN GOTO90 ELSE
GOSUB300:GOTO77
78 LINEINPUT"  TYPE IN MONTH 9.
```

```
";X$:IF X$=I$ THEN GOTO90 ELSE G
OSUB300:GOTO78
79 LINEINPUT"  TYPE IN MONTH 10.
";X$:IFX$=J$ THEN GOTO90 ELSE GO
SUB300:GOTO79
80 LINEINPUT"  TYPE IN MONTH 11.
";X$:IF X$=K$ THEN GOTO90 ELSE G
OSUB300:GOTO80
81 LINEINPUT"  TYPE IN MONTH 12.
";X$:IF X$=L$ THEN GOTO 90 ELSE
GOSUB300:GOTO81
90 C=C+1: IF C<13 THEN CLS
95 IF C=12 THEN 500 ELSE NEXT
300 F=F+1:PRINT: PRINT"  WRONG!
 TRY AGAIN, "N$;,:T=T+1:IF T=3 T
HEN CLS:GOTO24 ELSE RETURN
490 NEXT
499 GOTO499
500 '<RACE>
510 CLS
520 FOR X=1 TO 5:PRINT:NEXTX
530 PRINTTAB(11)"GOOD WORK,"
540 PRINT
550 PRINTTAB(12)N$"!"
560 PRINT:PRINTTAB(6)"YOU TYPED
ALL TWELVE":PRINTTAB(8)"MONTHS C
ORRECTLY."
570 FOR C=3 TO7 STEP2
575 IF C=5 GOSUB1000
576 IF C=7 GOTO790
580 FOR H=0 TO 63STEP2:SET(H,0,C
):NEXTH
590 FOR V=0 TO 31STEP+2:SET(63,V
,C):NEXTV
600 FOR H=63 TO 0 STEP-2:SET(H,3
1,C):NEXTH
610 FOR V=31 TO 2 STEP-2:SET(0,V
,C):NEXTV
620 FOR H=2 TO 61 STEP2:SET(H,2,
C):NEXTH
630 FOR V=2 TO 29 STEP2:SET(61,V
,C):NEXTV
640 FOR H=59 TO 2 STEP-2:SET(H,2
9,C):NEXTH
650 FOR V=27 TO 4 STEP-2:SET(2,V
,C):NEXTV
660 FOR H=4TO59 STEP2:SET(H,4,C)
:NEXTH
670 FOR V=4TO27 STEP2:SET(59,V,C
):NEXTV
680 FOR H=57 TO4STEP-2:SET(H,27,
C):NEXTH
690 FOR V=25 TO 6 STEP-2:SET(4,V
,C):NEXTV
700 FOR H=6TO57 STEP2:SET(H,6,C)
:NEXTH
710 FOR V=6TO25 STEP2:SET(57,V,C
):NEXTV
720 FOR H=55 TO 6 STEP-2:SET(H,2
5,C):NEXTH
730 FOR V=23 TO6 STEP-2:SET(6,V,
C):NEXTV
740 FOR H=8TO55STEP2:SET(H,8,C):
NEXTH
750 FOR V=8 TO23 STEP2:SET(55,V,
C):NEXTV
760 FOR H=53 TO8STEP-2:SET(H,23,
C):NEXTH
770 FOR V=21 TO 8STEP-2:SET(8,V,
C):NEXTV
780 NEXTC:IF C=7 GOTO790
790 FORH=10TO53STEP2:SET(H,10,C)
:NEXTH
800 FOR V=10 TO21STEP2:SET(53,V,
C):NEXTV
810 FOR H=51 TO10STEP-2:SET(H,21
,C):NEXTH
820 FOR V=19 TO 12STEP-2:SET(10,
V,C):NEXTV
830 FORH=12 TO51 STEP2:SET(H,12,
C):NEXTH
840 FOR V=12 TO19 STEP2:SET(51,V
,C):NEXTV
850 FORH=49 TO12 STEP-2:SET(H,19
,C):NEXTH
860 FOR V=17 TO14 STEP-2:SET(12,
V,C):NEXTV
870 FORH=14TO49STEP2:SET(H,14,C)
:NEXTH
880 SET(49,16,C)
885 PRINT@264,"      ";N$" ";
890 SCREEN0,1:'FOR H=47 TO14STEP
-2:SET(H,16,C):NEXTH
900 NEXTC:FORZ=1TO1000:NEXT:CLS:
GOTO20
910 GOTO910
1000 SCREEN0,1: FOR Z=1TO2000:NE
XT
1005 PRINT@170,"              ";
1010 PRINT@197,"      DO IT AGAIN
,";
1011 PRINT@197+32,"
    ";
1012 PRINT@197+64,"        ";N$"?
";
1013 PRINT@197+96,"
      ";
1014 PRINT@197+128,"    ";
1015 'PRINT@328,"      YES/NO
  ";
1020 PRINT"   YES/NO    ";
1025 Z$=INKEY$:IF Z$="" GOTO1025
1030 IF LEFT$(Z$,1)="Y" THEN RET
URN
1040 IF LEFT$(Z$,1)="N" THEN CLS
2:PRINT@198," BYE,BYE, ";N$" ";
1050 GOTO1050
```

RAINBOW

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in THE RAINBOW's "Scoreboard" column. All entries must be received 60 days prior to publication. Entries should be printed — legibly — and must include your *full* name, address, game title, company name and, of course, your high score. Each individual is limited to three score entries per month. Send your entries to Scoreboard, c/o THE RAINBOW.

For greater convenience, your high scores may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` and address to: `EDITORS`.

★ Current Record Holder ● Shutout

ADVANCED STAR*TRENCH (THE RAINBOW, 7/86)

4,750	★Stephane Martel, Laval, Quebec
4,475	David Schaller, Clarkston, WA
4,500	Frankie DiGiovanni, Olney, MD
4,300	Jeffrey Warren, Waynesville, NC
3,960	Maurice MacGarvey, Dawson Creek, British Columbia

ASTRO BLAST *(Mark Data)*

48,825	★Tony Bacon, Mt. Vernon, IN

BALLOON (THE RAINBOW, 6/87)

7,000	★Jon Hobson, Plainfield, WI

BEE ZAPPER (THE RAINBOW, 9/87)

15,785	★David Hartmann, Osoyoos, British Columbia
12,825	Frederick Lajoie, Nova Scotia, Canada
12,350	Tom Carpenter, Palenville, NY
11,675	Daniel Hartmann, Osoyoos, British Columbia
10,850	Matthew Yarrows, Easthampton, MA

BOUNCING BOULDERS *(Diecom Products)*

10,930	★Patrick Garneau, Ste-Croix, Quebec

BUZZARD BAIT *(Tom Mix)*

22,931,850	★Skip Taday, East Lyme, CT
763,550	Geran Stalker, Rivordalo, GA
187,750	Keith Janas, Kitwanga, British Columbia

CANYON CLIMBER *(Radio Shack)*

1,725,100	★John Guptill, Columbia, MO
1,627,500	Matthew Fumich, Munford, TN
202,000	David Brown, New Waterford, Nova Scotia
178,200	Darren King, Yorkton, Saskatchewan
169,000	Gregory Speer, Emporia, KS

CASHMAN *(MichTron)*

9,870	★Martin Parada, Arcadia, CA

CLOWNS & BALLOONS *(Radio Shack)*

688,960	★Faye Keefer, Augusta, GA
217,500	Frankie DiGiovanni, Olney, MD
70,180	Charles Andrews, Delta Jct, AK
36,650	Melody Webb, Lakeport, CA
33,710	Timm Cappell, Freeland, MI

COLOR BASEBALL *(Radio Shack)*

119-0	★●Adam Silverstein, Chicago, IL
111-2	David Czarnecki, Northhampton, MA
43-0	●Jason Kopp, Downs, IL

COLOR CAR *(NOVASOFT)*

252,928	★Alan Martin, Cornwall, Ontario
110,870	Martin Parada, Arcadia, CA

COLOR POKER (THE RAINBOW, 4/83)

38,011,600	★Earl Foster, Lynchburg, VA

THE CONTROLLERS (THE RAINBOW, 2/88)

188	★Frederick Lajoie, Nova Scotia, Canada

CRYSTAL CASTLES *(ThunderVision)*

381,138	★Jason Trammel, Murphysboro, IL

DALLAS QUEST *(Radio Shack)*

81	★Brad Wilson, Lithia Springs, GA
85	Paul Summers, Orange Park, FL
85	David and Shirley Johnson, Leicester, NC
86	Roy Grant, Toledo, OH
86	Melanie Moor, Florence, AL
87	Andrew Yarrows, Easthampton, MA
87	Douglas Bell, Duncan, OK
102	Hugh Flournoy, Jr., Spanaway, WA

DECATHALON *(Spectral Associates)*

9,408	★Martin Parada, Arcadia, CA

DEFENSE *(Spectral Associates)*

16,305	★Patrick Martel, Laval, Quebec

DEF MOV (THE RAINBOW, 1/87)

43,806	★Domingo Martinez, Miami, FL
35,331	David Schaller, Clarkston, WA
31,673	Douglas Bacon, Middletown, CT
30,753	Pasha Irshad, Silver Spring, MD
30,326	Frederick Lajoie, Nova Scotia, Canada

DEMON ATTACK *(Imagic)*

279,435	★Jon Hobson, Plainfield, WI
202,260	Tom Briggs, Hillsdale, NY
89,285	Upton Thomas, Arnold, MD
72,410	Glenn Hodgson, Aberdeenshire, Scotland
67,760	Jim Davis, Sandwich, IL

DESERT RIDER *(Radio Shack)*

80,703	★Thomas Payton, Anderson, SC
65,351	Jason Hackley, Clinton, CT
63,014	Rebecca Henderson, Ballston Spa, NY
62,702	William Currie, Bryans Road, MD
50,797	Patrick Devitt, Lombard, IL
47,677	Thomas Beall, Odenton, MD

DEVIL ASSAULT *(Tom Mix)*

1,866,100	★Stephane Martel, Laval, Quebec
623,550	Dale Krueger, Maple Ridge, British Columbia
75,000	Blake Cadmus, Reading, PA
40,800	Benoit Landry, Drummondville, Quebec

DONPAN *(Radio Shack)*

53,100	★Jim Davis, Sandwich, IL
52,600	Eric Olson, Wheaton, IL

DOUBLE BACK *(Radio Shack)*

207,860	★Upton Thomas, Arnold, MD
172,320	Richard Winkelbauer, Bronx, NY
136,510	Don Mullis, Delavan, WI
51,470	Betty Mullis, Delavan, WI
50,700	Tristan Terkuc, Richmond, Ontario

DOWNLAND *(Radio Shack)*

99,980	★Danny Wimett, Rome, NY
98,985	Karl Gulliford, Summerville, SC
97,740	Stephane Deshaies, Beloeil, Quebec
89,490	Neil Edge, Williston, FL
77,254	Tom Audas, Fremont, CA
73,346	Jean-Francois Morin, Loretteville, Quebec
70,142	Chris Goodman, Baltimore, MD
68,142	Cooper Valentin, Vavenby, British Columbia
67,721	Keith Yampanis, Jaffrey, NH
62,442	Eddie Lawrence, Pasadena, Newfoundland
55,300	Patrico Gonzalez, Buenos Aires, Argentina
49,500	Danny Perkins, Clifton Forge, VA
49,441	Kevin Pater, Port Alberni, British Columbia
49,254	David Brown, New Waterford, Nova Scotia
43,502	Mike Ells, Charlotte, MI
41,896	Antonio Hidalgo, San Jose, Costa Rica
40,360	Jesse Binns, Phoenix, AZ
35,611	Adam Broughton, Morris, PA

DRAGON FIRE *(Radio Shack)*

160,835	★Eric Olson, Wheaton, IL
146,325	Stephane Martel, Laval, Quebec
11,726	Marcos Rodriguez, New York, NY
9,861	Michael Adams, Columbia, SC
9,200	Jesse Cogdell, Wilmington, DE

ENCHANTER *(Infocom)*

400/223	★Konnie Grant, Toledo, OH

ESCAPE 2012 *(Computerware)*

202	★Roy Grant, Toledo, OH
199	Milan Parekh, Anaheim, CA

FANGMAN *(Tom Mix)*

217,650	★Martin Parada, Arcadia, CA

FIRE COPTER *(Adventure International)*

77,030	★Mike LeBrun, Cornwall, Ontario
56,840	Michael Adams, Columbia, SC

FIRESTORM (THE RAINBOW, 1/86)

22,505	★Chad Presley, Luseland, Saskatchewan
11,250	Stephane Martel, Laval, Quebec
5,680	Kathy Rumpel, Arcadia, WI
3,760	Rick Beevers, Bloomfield, MN
3,505	Blake Cadmus, Reading, PA

GALACTIC ATTACK *(Radio Shack)*

31,100	★Upton Thomas, Arnold, MD
29,030	David Czarnecki, Northhampton, MA
26,370	Jeff Remick, Warren, MI
22,250	Dave Staub, Moundsville, WV
11,830	Sheldon Penney, Green Bay, Newfoundland

GALAGON *(Spectral Associates)*

751,020	★Sofia Giorgi, Brasilia, Brazil
357,890	Jason Clough, Houston, TX
328,820	Bernard Burke, Lee's Summit, MO
249,960	Matthew Fumich, Munford, TN
169,410	Danny Dunne, Pittsfield, NH

GANTELET *(Diecom Products)*

23,643,720	★Geran Stalker, Rivordalo, GA
20,921,490	Randall Edwards, Dunlap, KS
10,222,940	Clinton Morell, Sacramento, CA
10,020,500	Ken Hubbard, Madison, WI
7,493,340	Stirling Dell, Dundalk, Ontario

GHANA BWANA *(Radio Shack)*

2,350,750	★Michael Heitz, Chicago, IL
702,520	Joseph Delaney, Augusta, GA
105,820	David Reash, Hadley, PA

GOLD FINDER *(Tom Mix)*

100,775	★Jesse Collicott, Inman, KS

GONE FISHING (THE RAINBOW, 1/84)

7	★Benoit St-Jean, Gatineau, Quebec

GROBOT *(Children's Computer Workshop)*

8,090	★Curt Lebel, Louisville, KY

HITCHHIKER'S GUIDE TO THE GALAXY *(Infocom)*

400/359	★Roy Grant, Toledo, OH
400/422	Jeff Holtham, Waterloo, Ontario
400/510	Brad Wilson, Lithia Springs, GA

INTERBANK INCIDENT *(Radio Shack)*

4,861	★Shara and Chris Euton, Lilburn, GA

IRON FOREST *(Diecom Products)*

3,173,200	★Charles Boyd, Amarillo, TX
2,676,300	Janet Boyd, Amarillo, TX
1,141,650	Craig Pennell, Amarillo, TX
1,013,100	William Weller, Kailua, HI
595,700	Daniel Wibier, Santa Rosa, CA

JOKER POKER (THE RAINBOW, 3/87)

43,616,750	★Carole Rueckert, Mansfield, OH
8,179,710	Brenda Kim, Athens, OH
3,796,898	Curtis Trammel, Murphysboro, IL
2,793,285	Blain Jamieson, Kingston, Ontario
205,239	Paul Dykes, Baton Rouge, LA

JUNIOR'S REVENGE *(Computerware)*

2,503,000	★Stephane Martel, Laval, Quebec
257,600	Keith Cohen, Rocky Mount, NC

KARATE *(Diecom Products)*

31,000	★Wayne Hufford, Kincardine, Ontario
21,800	Daniel Hartmann, Osoyoos, British Columbia

SCOREBOARD

11,600 Jonathon Ross, Pocomoke City, MD
6,300 David Darling, Longlac, Ontario
KNOCK OUT *(Diecom Products)*
162,555 ★Martin Parada, Arcadia, CA
147,235 Mike LeBrun, Cornwall, Ontario
KORONIS RIFT *(Epyx)*
186,710 ★Tony Harbin, Cullman, AL
184,180 Russell Johnson, Sarnia, Ontario
184,120 John Farrar, Lebanon, TN
174,810 Donald Cathcart, Halifax, Nova Scotia
133,990 Paul Blessing, Spring, TX
KUNG-FU DUDE *(Sundog Systems)*
32,000 ★Tony Geitgey, University Park, PA
12,150 Cody Deegan, Fallon, NV
THE LAIR *(Freebooter Software)*
112,940 ★James Walton, Pittsburgh, PA
LUNAR RESCUE (THE RAINBOW 8/87)
260,427 ★Tom Beeker, Gracey, KY
259,493 Cody Deegan, Fallon, NV
255,625 John Valentine, Marlborough, CT
246,668 Phillip Holsten, Modesto, CA
175,771 Jim Davis, Sandwich, IL
LUNAR-ROVER PATROL *(Spectral Associates)*
37,890 ★Dave Staub, Moundsville, WV
MAGIC OF ZANTH *(Computerware)*
31 ★Paul Summers, Orange Park, FL
44 Matthew Smith, Courtenay, British Columbia
45 Michael Green, Ware, MA
47 Robert Williams, Yellowknife, Northwest Territory
MEGA-BUG *(Radio Shack)*
9,016 ★Heather Richwalski, Medford, WI
8,199 Eric Mellon, Newark, DE
6,404 David Hartmann, Osoyoos, British Columbia
5,960 Mary Jensen, El Cajon, CA
5,528 Douglas Bacon, Middletown, CT
MEMOCARDS (THE RAINBOW, 8/87)
1,418 ★Edward Kavanaugh, North Easton, MA
MICROBES *(Radio Shack)*
153,790 ★Jeff Spiller, Sinclairville, NY
MINIGOLF (THE RAINBOW, 5/86)
29 ★John Guptill, Columbia, MO
MISSION: F-16 ASSAULT *(Diecom Products)*
468,750 ★Karen Jessen, Cleveland, OH
355,570 Stirling Dell, Dundalk, Ontario
318,160 Jeremy Pruski, Sandwich, IL
144,510 Donald Cathcart, Halifax, Nova Scotia
137,920 Mike Grant, Fresno, CA
MUNCHKIN BLASTER (THE RAINBOW, 8/87)
11,950 ★Jim Davis, Sandwich, IL
10,420 Gabe Emerson, Baraboo, WI
9,760 Tom Beeker, Gracey, KY
9,270 Edward Kavanaugh, North Easton, MA
9,080 John Weaver, Amsterdam, NY
8,720 Jacob Carpenter, Palenville, NY
5,670 Clara Smith, Courtenay, British Columbia
ONE-ON-ONE *(Radio Shack)*
1,302-0 ★●Thomas Payton, Anderson, SC
1,276-0 ●Jonathan Dorris, Indianapolis, IN
1,260-0 ●Brandon Reece, Chickamauga, GA
1,242-0 ●William Currie, Bryans Road, MD
1,210-0 ●Gregg Thompson, Chesterfield, VA
OUTHOUSE *(MichTron)*
38,640 ★Dave Staub, Moundsville, WV
PAPER ROUTE *(Diecom Products)*
150,560 ★Heather Hamblen, Bar Harbor, ME
PEGASUS AND THE PHANTOM RIDERS *(Radio Shack)*
329,000 ★Joseph Delaney, Augusta, GA
303,100 Mike Grant, Fresno, CA
261,000 Domingo Martinez, Miami, FL
225,300 Richard Adams, Jr., Alvarado, TX
114,100 Kreig Bryson, Woodstock, GA
PINBALL *(Radio Shack)*
1,139,450 ★Benoit Landry, Drummondville, Quebec
399,350 Troy Stoll, Washington, IN
389,463 Thomas Payton, Anderson, SC
213,300 Patrick Martel, Laval, Quebec
142,400 Thomas Payton, Anderson, SC
PITFALL II *(Activision)*
159,400 ★David Cornette, Green Bay, WI
104,479 David Stewart, Kent, OH
PITSTOP II *(Epyx)*
54 ★Rusty Breitbach, Rickardsville, IA
54 ★Jeff Coburn, Easton, PA
54 ★Walter Hearne, Pensacola, FL
54 ★Sean Noonan, Green Bay, WI
54 ★Thomas Payton, Anderson, SC
54 ★Jeff Szczerba, Sturtevant, WI
54 ★Brad Wilson, Lithia Springs, GA
51 Christian Grenier, Valleyfield, Quebec
49 Randy Venable, Coal City, WV
14 Eric Mellon, Newark, DE
9 Laundre Clemon, Sacramento, CA
POPCORN *(Radio Shack)*
105,560 ★Heather Condit, Grafton, ND
20,800 Kristopher Santos, Laurel, MD
PYRAMID *(Radio Shack)*
220 ★Jason Ebbeling, Berkshire, MA
PYRAMID 2000 *(Radio Shack)*
220 ★Darren King, Yorkton, Saskatchewan
100 Peter Antonacopoulos, Toa Baja, Puerto Rico
PYRAMIX *(ColorVenture)*
67,850 ★Richard Winkelbauer, Bronx, NY
56,970 Andy Freeman, Turtle Lake, WI
37,500 Matthew Smith, Courtenay, British Columbia
26,900 Todd Kopke, Glendale Heights, IL
20,120 Lori Curran, La Porte City, IA
QUIX *(Tom Mix)*
8,407,772 ★John Haldane, Tempe, AZ
1,404,000 Curtis Goodson, Sao Paulo, Brazil
1,201,383 Milan Parekh, Anaheim, CA
1,003,104 Elisa Goodson, Sao Paulo, Brazil
326,192 Martin Parada, Arcadia, CA
RADIO BALL *(Radio Shack)*
760,380 ★Jake Runge, Franklin, OH
399,999 Eric Mellon, Newark, DE
RESCUE ON FRACTALUS *(Epyx)*
1,000,948 ★Steven Ujvary, Calgary, Alberta
323,167 Kenneth Hill, Severna Park, MD
292,633 David Richards, Huntington, WV
288,084 Donald Cathcart, Halifax, Nova Scotia
270,000 Russell Johnson, Sarnia, Ontario
RETURN OF THE JET-I *(ThunderVision)*
336,563 ★Jesse Collicott, Inman, KS
RETURN OF JUNIOR'S REVENGE *(Colorware)*
1,792,800 ★Chad Presley, Luseland, Saskatchewan
ROGUE *(Epyx)*
63,934 ★Marshall Weisenburger, Quincy, IL
43,222 Hans Lutenegger, Madison, IA
27,542 Melanie Lapoint, Fitchburg, MA
21,682 Paul Blessing, Spring, TX
17,851 Yvan Langlois, Laval, Quebec
ROLLER CONTROLLER *(Spectral Associates)*
35,950 ★Matthew Smith, Courtenay, British Columbia
SANDS OF EGYPT *(Radio Shack)*
67 ★Tristan Terkuc, Richmond, Ontario
82 Edward Rocha, Cobleskill, NY
85 Paul Summers, Orange Park, FL
86 Roy Grant, Toledo, OH
87 Neil Haupt, Elyria, OH
SAUCER DEFENSE *(THE RAINBOW, 4/87)*
40,000 ★David Hartmann, Osoyoos, British Columbia
4,000 Frankie DiGiovanni, Olney, MD
SHOCK TROOPER *(Mark Data)*
78,575 ★Mike LeBrun, Cornwall, Ontario
SHOOTING GALLERY *(Radio Shack)*
27,270 ★Jocelyn Hellyer, Montgomery, IL
20,480 Kevin Pereira, Corsicana, TX
SHOOT'N RANGE (THE RAINBOW, 8/87)
55,623 ★Paul Robbins, Picayune, MS
14,702 Richard Winkelbauer, Bronx, NY
13,794 Phillip Holsten, Modesto, CA
5,433 Benoit Landry, Drummondville, Quebec
SLAY THE NERIUS *(Radio Shack)*
73,091 ★Jeff Remick, Warren, MI
SPACE ASSAULT *(Radio Shack)*
13,110 ★Jeff Remick, Warren, MI
7,280 Jason Kopp, Downs, IL
6,200 John Weaver, Amsterdam, NY
SPEEDSTER (THE RAINBOW 8/87)
103,140 ★Richard Winkelbauer, Bronx, NY
88,090 Jason Landreth, Texico, IL
37,970 Frederick Lajoie, Nova Scotia, Canada
35,040 John Valentine, Marlborough, CT
32,110 Lisa Williamson, Watauga, TX
SPIDERCIDE *(Radio Shack)*
27,730 ★Mike LeBrun, Cornwall, Ontario
1,840 Dave Staub, Moundsville, WV
SPRINGSTER *(Radio Shack)*
303,520 ★Mavis Hartmann, Osoyoos, British Columbia
SUPER ROOTER (THE RAINBOW, 5/86)
19,090 ★Frederick Lajoie, Nova Scotia, Canada
15,180 Richard Donnell, Penns Grove, NJ
3,910 Daniel Bradford, Birmingham, AL
TEMPLE OF ROM *(Radio Shack)*
604,000 ★Troy Graham, Arnold, MD
507,700 Adam Broughton, Morris, PA
303,600 Tim Hennon, Highland, IN
138,400 Gary Budzak, Westerville, OH
125,200 Michelle Murray, Salem, IN
THEXDER *(Sierra On-Line)*
1,314,100 ★Frankie DiGiovanni, Olney, MD
195,000 Emmett Keyser, Napa, CA
TREASURE QUEST (THE RAINBOW, 11/86)
66,760 ★Clara Smith, Courtenay, British Columbia
29,340 Matthew Smith, Courtenay, British Columbia
TREKBOER *(Mark Data)*
123 ★Roy Grant, Toledo, OH
132 Matthew Fumich, Munford, TN
TUT'S TOMB *(Mark Data)*
118,720 ★Reina Roy, Carleton, Quebec
74,780 Mack Haynes, Nice, CA
72,000 Chad Presley, Luseland, Saskatchewan
60,020 Don Siler, Muncie, IN
45,000 Blake Cadmus, Reading, PA
VARLOC *(Radio Shack)*
2,032 ★Tony Harbin, Cullman, AL
2,032 ★Edward Rocha, Cobleskill, NY
2,008 Philip Puffinburger, Winchester, VA
1,995 Denise Rowan, Minneapolis, MN
1,991 Ryan Grady, Newbury Park, CA
1,988 Randall Edwards, Dunlap, KS
VICIOUS VIC (THE RAINBOW, 7/86)
18,813 ★Talib Khan, Bronx, NY
11,902 Martha James, Swarthmore, PA
10,489 Karl Gulliford, Summerville, SC
6,294 Pat O'Neill, Nepean, Ontario
4,643 Martha James, Swarthmore, PA
THE VORTEX FACTOR *(Mark Data)*
100/276 ★Tommy Crouser, Dunbar, WV
100/483 Rick & Brenda Stump, Laureldale, PA
210 Paul Maxwell, Vancouver, British Columbia
WARP FACTOR X *(Prickly-Pear)*
10,577,051 ★Doug Lute, Clymer, PA
WILDWEST *(Tom Mix)*
35 ★Paul Summers, Orange Park, FL
WISHBRINGER *(Infocom)*
400/201 ★Brad Wilson, Lithia Springs, GA
WIZARD'S DEN *(Tom Mix)*
195,050 ★Mark Touchette, Preston, CT
WRESTLE MANIAC *(Diecom)*
956,971 ★Marc Reiter, Cincinnati, OH
546,315 Louis Bouchard, Gatineau, Quebec
45,483 Tony Bacon, Mt. Vernon, IN
42,105 David Brown, New Waterford, Nova Scotia
39,086 Billy Helmick, Independence, KY
ZAKSUND *(Elite Software)*
357,550 ★Martin Parada, Arcadia, CA
268,350 Tony Bacon, Mt. Vernon, IN
44,900 Michael Adams, Columbia, SC
39,950 Walter Hearne, Pensacola, FL
ZAXXON *(Datasoft)*
2,061,000 ★Byron Alford, Raytown, MO
1,950,000 Blake Cadmus, Reading, PA
1,300,500 Dan Brown, Pittsford, NY
1,100,600 Andrew Urquhart, Metairie, LA
376,600 Matthew Yarrows, Easthampton, MA
ZEUS *(Aardvark)*
4,500 ★Benoit St-Jean, Gatineau, Quebec
3,380 Martin Kertz, Forrest City, AR
ZORK I *(Infocom)*
350/328 ★Konnie Grant, Toledo, OH
350/587 Matthew Yarrows, Easthampton, MA
ZONX (THE RAINBOW, 10/85)
12,000 ★Adam Broughton, Morris, PA

— Jody Doyle

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints, tips or responses to questions, or want help yourself, we encourage you to write to the Scoreboard, c/o THE RAINBOW.

In response to questions from:

- Mike Snyder: In *Dungeons of Daggorath*, to get the iron sword and the ring on the first level, you must kill both blobs. To incant the ring, type `I FIRE`.

Vick Mishra
Newington, CT

- Sean Noonan: You need the diamond ring hidden in the grassy meadows atop the steps in *Sea Search*. You will need the shovel for this.

- Jimmy Munroe: The thing you stumbled over in the cavern behind the falls in *Sea Search* is the shovel. Simply type `GET SHOVEL`. If you haven't found the metal detector, it's in the meadows atop the steps.

To find the mermaid, get in the boat and go north twice. Go into the ocean (you must have the filled air tanks) and give her the mirror. The mirror is found by going east once past the steps on the beach and digging. Any clear liquid you find will be the shark repellant.

Laura Kaplan
Niceville, FL

- John Anderson: In *Sir Randolf of the Moors*, type `PULL CHAIN` and `WIPE WALLS` to reveal the exit from the pit.

There is one key that I have never been able to find, despite mapping the entire surrounding area. How do I get this elusive key?

Douglas Bacon
Middletown, CT

- John Peavy: In *Caladural Flame of Light*, you must have the amulet to get by the spears.

How do you get through the castle?

Mason Taylor
Cedar Falls, IA

Scoreboard:

How do you get to the fourth level in *Dungeons of Daggorath*?

John Sprinkle
Caneler, NC

Scoreboard:

In *Dallas Quest*, it is almost impossible to get through the wheat field. When I ask for a clue, I am told to solve the pasture mystery. Please help.

Tommy Upton
Rossville, GA

Scoreboard:

In *Sands of Egypt*, I am having trouble finding the canteen. Where is the magnifying glass to light the torch? How do you get out of the pool?

Ted Klug
Fennville, MI

Scoreboard:

In the *Interbank Incident*, to open the locker at the train station in Seattle, put a quarter in the locker and search it.

How do you open the apartment doors and where do you get the keys? How do you know when it's time for the video tournament?

Lori Morrish
Toronto, Ontario

Scoreboard:

In *Raaka-Tu*, does the rug mean anything and if it does, how do you cross it to open the door? What do you do when you get out of the temple through the secret passage way?

In *Pyramid 2000*, how do you find the treasure in the maze?

Mike Abballe
Rochester, NY

Scoreboard:

In *Raaka-Tu*, I have gotten out, but what do I do next?

John Mahan
Cape Coral, FL

Scoreboard:

When you get to the pub in *Shenanigans*, you have to order O'Shaunasee beer, then go W, S, W and W.

To get rid of the snake, you drop the shamrock at the cave entrance.

When you get to the ravine in the cave, type `SAY SEAN`.

I got to the rainbow, but I can't get near it without the pole, and the pole won't fit in the cave. How do I find the trap door in the cabin?

Annette Clear
San Diego, CA

Scoreboard:

I have the gem, the amulet and the circlet in *Caladuril Flame of Light*, but now I am stumped. Where do I find Sarazin so I can place the circlet on his head?

In *Wild West*, I have the treasure map from Black Bart's girlfriend, but where do I go from there?

In *Mythology*, how do you distract Atlanta so you can win the foot race and win her hand in marriage?

Floyd Keirnan
Orange, CA

Scoreboard:

In *Pyramid 2000*, to get the bird, you must first get the statue box. To pick up the bird you must drop the scepter. To get a gold nugget you must go around a great hall. To scare the serpent, throw the bird.

When you get to the plant begging for water, how do you get the water to the ground without breaking the vase? Is there something to drop it on? If so, what?

David Czarnecki
Northampton, MA

Scoreboard:

In *Sir Randolf of the Moors*, type `WIPE SLIME`, `LOOK WALL`, `LOOK OUTLINE` and `PULL RING` to get out of the pit.

In the *Interbank Incident*, search the water fountain in Rio and you will find a ring.

In the *Lighthouse Adventure*, how do you get past the guard?

In *Escape from Sparta*, where do you find the chips that give you access to the computer?

Charles Bell
Clinton, NJ

Scoreboard:

How do you navigate the mine room in *Robot Odyssey I*?

Andrew Irwin
Port Huron, MI

To respond to other readers' inquiries and requests for assistance, reply to "Scoreboard Pointers," c/o THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will share your reply with all "Scoreboard" readers in an upcoming issue.

For greater convenience, "Scoreboard Pointers" and requests for assistance may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` and address to: `EDITORS`. Be sure to include your complete name and address.

A program enabling you to view MacPaint picture files on your CoCo

Get the Picture?

By Al Elmer

Although several *MacPaint* viewers are available for the CoCo 3, it is more difficult to find one for the CoCo 2. I have written this program specifically for the CoCo 2, but it is compatible with the CoCo 3. The program requires 64K Extended Color BASIC and a disk drive to run. With a few minor modifications that are explained later, it will also work on cassette-based systems, although not too well.

First of all, what is *MacPaint*? *MacPaint* is a drawing program for the Apple Macintosh computer. Files generated by *MacPaint* usually have the extension `.MAC`, although `.PIC` and `.PNT` are also common. In order to view *MacPaint* picture files on your CoCo, the problem of different screen resolutions between the Macintosh and CoCo must be solved. *MacPaint* (*Mac* for short) pictures have a resolution of 576-by-720 while the highest resolution of the CoCo 2 is 256-by-192. Thus only a portion of a *Mac* image can be displayed on the CoCo's highest resolution screen. To solve the problem, this program allows you to scroll around the entire *Mac* image by pressing the arrow keys. Also offered is the ability to compress the image both horizontally and vertically by a factor of two. This "shrink" mode is useful when you want to see a larger part of the image at once. One drawback of shrinking the image like this is that some detail is lost.

To load a new *Mac* file, press L at the menu. You will then be prompted for a filename. If you do not specify an extension, `.MAC` will be used automatically. The file will then be loaded into memory. Once loaded, the upper left corner of the picture will be displayed. At this point the arrow keys can be used to scroll around the entire *Mac* image. The CLEAR key can be used to toggle between the present display mode and the shrink mode. This is useful if you want to see the image from a broader perspective. The compressed image will begin from the same position as the uncompressed image. Although the arrow keys will still function in the shrink mode, it takes much longer to update the screen in this mode. For this reason it is recommended that you position the image while in the full size display mode and then switch to the shrink mode when you want to see the compressed view. While in the shrink mode, pressing the number keys 1 through 4 will alter the contrast of the image. Whenever a new file is loaded this value is reset to 2.

At some point you may find yourself with a *Mac* file that has been shifted horizontally, perhaps to align it with the right-hand border of another computer with a higher resolution screen. As a result the left and right borders of the image will appear to meet at some point in the middle of your viewing area. By pressing the SHIFT and left arrow or SHIFT and right arrow keys, you may be able to shift this discontinuity until it disappears.

Pressing the space bar at any time will return you to the menu. You can use the space bar to toggle between the menu and the picture. If you want to save whatever is on the current `PMODE4` screen, you can press S at the menu. You will be prompted for a filename, and the graphics screen will be saved to disk as a standard binary file. If you do not specify an extension, `.BIN` will be used automatically.

You can call up a directory by pressing D at the menu. After the directory is displayed, the computer will pause for you to press any key and then return to the menu. To quit the program, press Q. Ending this way is recommended; the computer's memory will be freed up, allowing you to load in another program without crashing the computer. Also, the drive head will be returned to Track 0 for those drives that suffer from the "head-banging" problem.

MacView can be used on cassette-based systems with a few minor modifications. These mostly involve changing the device number from '1' to "-1." The `EXEC` in Line 880 should be eliminated, and Line 1040 should be changed to `1040 EXEC E,-1`. Of course the usual modifications, like changing `SAVE` to `CSAVE` and so on, should be made. Also, the cassette files of *Mac* data should be in segmented format to work properly with this program. Although cassette operation is possible, it is not very practical due to the large size of *Mac* files. Disk operation is recommended. ☐

Al Elmer is a physics student at McMaster University. In his spare time he enjoys tinkering with electronics and programming the CoCo, for which he is especially interested in making graphics applications.

Editor's Note: Due to the size of Macintosh files, we are unable to include samples on this month's RAINBOW ON TAPE *and* DISK. *However, several files are available in the Graphics Database in the CoCo SIG on Delphi. Simply download the files and save them to disk. Then run* MacView.

150	217	590	232
300	193	870	3
450	233	END	63

The listing: `MACVIEW`

```
1 'macpaint file viewer
2 '  for the coco ii
3 '   (c) al elmer
4 '     03-11-88
10 DATA 34,1,BD,B2,23,BD,B3,ED
20 DATA D7,6F,30,8D,1,CA,9F,F3
30 DATA 8E,2,80,8D,39,30,1F,26
40 DATA FA,8D,33,81,7F,22,17,4C
50 DATA 97,FB,9E,F3,8D,28,43,A7
60 DATA 80,8C,FE,0,24,2C,A,FB
70 DATA 26,F2,9F,F3,20,E3,40,4C
80 DATA 97,FB,8D,12,43,9E,F3,A7
90 DATA 80,8C,FE,0,24,14,A,FB
100 DATA 26,F5,9F,F3,20,CB,B7,FF
110 DATA DE,BD,A1,76,1A,50,B7,FF
120 DATA DF,39,7F,FF,40,F,F6,F
130 DATA F7,B7,FF,DE,86,FE,97,FC
140 DATA 86,42,97,77,86,28,97,76
150 DATA F,FD,35,81,34,1,1A,50
160 DATA B7,FF,DF,17,0,BF,B7,FF
170 DATA DE,CC,FF,FF,FD,1,55,FD
180 DATA 1,57,AD,9F,A0,0,27,FA
190 DATA 81,5E,26,8,96,F7,27,E9
200 DATA A,F7,20,DC,81,A,26,A
210 DATA 96,F7,91,77,24,DB,C,F7
220 DATA 20,CE,81,8,26,8,96,F6
230 DATA 27,CF,A,F6,20,C2,81,9
240 DATA 26,A,96,F6,91,76,24,C1
250 DATA C,F6,20,B4,81,20,26,2
260 DATA 35,81,81,C,26,22,3,FD
270 DATA 86,28,97,76,86,42,97,77
280 DATA D,FD,27,9C,86,4,97,76
290 DATA 86,2A,97,77,96,F7,81,2A
300 DATA 23,8E,86,2A,97,F7,20,88
310 DATA 81,15,26,17,B7,FF,DF,30
320 DATA 8D,0,DD,CC,65,40,EE,1
330 DATA EF,81,83,0,1,26,F7,30
340 DATA 1E,20,17,81,5D,26,1A,B7
350 DATA FF,DF,30,8D,CB,41,CC,65
360 DATA 40,EE,83,EF,1,83,0,1
370 DATA 26,F7,86,FF,A7,1,16,FF
380 DATA 4F,81,31,10,25,FF,52,81
390 DATA 34,10,22,FF,4C,84,7,40
```

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One-Liner Contest Winner . . .

Here's one for SF fans. This one-liner draws a 3-D image on a background of stars and plays the intro to the movie *2001*.

The listing:

```
1 A=RND(256):B=RND(191):PMODE4:S
CREEN1:PSET(A,B):LINE(0,0)-(0,19
1),PSET:LINE-(256,191),PSET:IFX>
254ORY>190THENPLAY"O2L2B-O3FL2.B
-O4L16DL1D-P8P4P2O2L2B-O3FL2.B-O
4L16DL1D-P8P4P2P1O2L2B-O3FL2.B-O
4L16DL1E-"ELSELINE(0,Y)-(X,191),
PSET:Y=Y+10:X=X+10:GOTO1
```

Kevin J. Gross
Akron, PA

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape*.)

```
400 DATA 97,FC,16,FF,3B,86,C0,97
410 DATA FA,96,F7,C6,48,3D,58,49
420 DATA 58,49,58,49,30,8D,0,88
430 DATA 30,8B,96,F6,33,86,D,FD
440 DATA 26,35,10,DF,F8,10,DE,BA
450 DATA 32,66,37,36,34,36,32,6C
460 DATA 37,36,34,36,32,6C,37,36
470 DATA 34,36,32,6C,37,36,34,36
480 DATA 32,6C,37,36,34,36,EC,C4
490 DATA ED,66,32,6E,33,C8,2A,A
500 DATA FA,26,D7,10,DE,F8,39,9E
510 DATA BA,86,20,97,FB,86,2,97
520 DATA F3,A6,C0,97,FE,A6,C8,47
530 DATA C6,4,D7,F4,5F,48,C9,0
540 DATA 48,C9,0,8,FE,C9,0,8
550 DATA FE,D9,FC,69,84,A,F4,26
560 DATA EB,A,F3,26,DC,30,1,A
570 DATA FB,26,D2,33,C8,50,A,FA
580 DATA 26,C7,39,BE,C0,6,6F,84
590 DATA AD,9F,C0,4,7F,FF,40,39
700 PCLEAR4:PMODE4:FILES1,0
710 CLEAR 50,12689:E=12690
720 CLS:PRINT"just a sec...":C=0
730 FOR K=E TO E+471
740 READ A$:A=VAL("&H"+A$):POKEK
,A:C=C+A
750 NEXT K
760 IF C<>56331 THEN PRINT"bad n
ews - this copy is no good":END
770 CLS:PRINT@8,"macpaint viewer
":PRINT@47,"by":PRINT@76,"al elm
er"
780 PRINT@166,"(L)oad a file"
790 PRINT@230,"(S)ave a pmode 4
screen"
800 PRINT@294,"(D)ir"
810 PRINT@358,"(Q)uit"
820 PRINT@453,"<space> to view s
creen"
830 A$=INKEY$:IF A$="" THEN 830
840 IF A$="L" THEN GOSUB 1000
850 IF A$="S" THEN GOSUB 2000
860 IF A$=" " THEN GOSUB 3000
870 IF A$="D" THEN CLS:DIR:EXEC4
4539:A$=INKEY$:GOTO 770
880 IF A$="Q" THEN EXEC E+459:CL
EAR200,32000:CLS:PRINT">>burp!<<
":END
890 GOTO 770
1000 CLS:INPUT"load filename";F$
1010 IF INSTR(F$,".")=0 THEN F$=
F$+".MAC"
1020 CLS:PRINT"uncrunching ";F$
1030 OPEN"I",#1,F$
1040 EXEC E,1
1050 CLOSE#1:SCREEN1,1
1060 EXEC E+116
1070 RETURN
2000 CLS:INPUT"save filename";F$
2010 IF INSTR(F$,".")=0 THEN F$=
F$+".BIN"
2020 CLS:PRINT"saving pmode4 fil
e ";F$
2030 S=256*PEEK(186)+PEEK(187)
2040 SAVEM F$,S,S+6143,44539
2050 RETURN
3000 SCREEN1,1
3010 EXEC E+116
3020 RETURN
```

One-Liner Contest Winner . . .

This short program is a random graphics generator that creates geometric patterns with `DRAW` strings.

The listing:

```
0 DATAU,D,L,R,E,F,G,H:FORC=1TO9:
READC$(C):NEXT:FORZ=1TO19:S$=S$+
C$(RND(8))+STR$(RND(4)):NEXTZ:PM
ODE3,1:SCREEN1,0:C$=STR$(RND(3)+
1):DRAW"C"+C$:FORS=1TO60STEP2:FO
RA=0TO3:DRAW"BM127,95;A"+STR$(A)
+"S"+STR$(S)+S$:NEXTA,S:S$="":RU
N
```

Mike Sims
Nanuet, NY

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape*.)

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NEW FROM K-SOFT

Add embedded printer commands to Write III

Write III Plus

By Larry E. Bates

When I saw the CoCo 3's 80-column screen, I instantly thought of word processors and began to look for one that would use 80 columns. Everything on the market, though, was at least $80; after just buying a new computer, I couldn't afford that. Then I found the April '87 issue of RAINBOW, which featured *Write III*, a word processor written in BASIC. Bill Cook's program was great for most uses, but it didn't allow embedded printer commands. With a few changes, it can compete with commercial programs.

Load or type in *Write III* [April '87, Page 156], and then make the changes shown in Listing 1. The lines are numbered so that they will merge without renumbering the original. To center text, type `;CT` and then your text. To make the text elongated, type `;CE` instead. All other printer commands can be made by pressing the SHIFT and CLEAR keys, followed by the appropriate number below:

0= Underline On   1=Underline Off
2= Bold On   3=Bold Off
4= Elongate On   5=Elongate Off
B1=Italics On   B0=Italics Off

These codes are for a DMP-130. If you have another kind, just change the `CHR$` codes to match your printer. Once the changes have been made, run the program as usual.

(Questions or comments concerning this program may be directed to the author at 5348 Queens Ave. NE, Keizer, OR 97303. Please enclose an SASE when requesting a reply.) ☐

Larry Bates is an electronic technician who has been programming for six years. He and his wife have two children who love their dad's new CoCo.

Editor's Note: The complete modified version of Write III *will be presented on this month's* RAINBOW ON TAPE *and* DISK.

The listing: WRITE3+

```
6 ' PRINTER CODES:  \0 & \1=UNDE
RLINE ON & OFF     \2 & \3=BOLD O
N & OFF
    \4 & \5=ELONGATE ON & OFF
  \B1 & \B0=ITALICS ON & OFF
7 ' ;CT WILL CENTER A LINE OF TE
XT.  ;CE WILL CENTER OF LINE OF
ELONGATED TEXT.      ;LM=LEFT MAR
GIN  ;RM=RIGHT MARGIN  ;SP=SPACI
NG  ;LP=LINES/PAGE
8 ' ;N=NEW PAGE
9 CT$=STRING$(80,CHR$(32))
4171 A$=L$(NO):Z1$=" !#$%&'()*=1
234567890:-@+;?/>.<,ABCDEFGHIJKL
MNOPQRSTUVWXYZabcdefghijklmnopqr
stuvwxyz\":LOCATE1,V:ATTR1,1:PRI
NTA$;:IFH=0THENH=1:GOSUB37 ELSE
GOSUB37
5004 LM=10:RM=10:LG=80-LM-RM:LP=
55:PG=0:L1=0:SP=1:BF=0:B$="":LF=
0:UL=0
5021 X1=INSTR(A$,"\"):IFX1=0THEN
5030
5022 IF MID$(A$,X1+1,1)="0" THEN
 MID$(A$,X1,2)=CHR$(0)+CHR$(15)
ELSE IF MID$(A$,X1+1,1)="1" THEN
 MID$(A$,X1,2)=CHR$(0)+CHR$(14)
 ' UNDERLINE ON & OFF
5023 IF MID$(A$,X1+1,1)="4" THEN
 MID$(A$,X1,2)=CHR$(27)+CHR$(14)
 ELSE IF MID$(A$,X1+1,1)="5" THE
N MID$(A$,X1,2)=CHR$(27)+CHR$(15
) ' ELONGATE ON & OFF
5024 IF MID$(A$,X1+1,1)="2" THEN
 MID$(A$,X1,2)=CHR$(27)+CHR$(31)
 ELSE IF MID$(A$,X1+1,1)="3" THE
N MID$(A$,X1,2)=CHR$(27)+CHR$(32
) ' BOLD ON AND OFF
5025 IF MID$(A$,X1+1,1)="B" THEN
 MID$(A$,X1,1)=CHR$(27) ' ITALIC
S ON & OFF
5029 GOTO5021
5057 IF LEN(B$)>LG THEN A$=B$:B$
="":GOTO5030
5555 X=INSTR(A$,";CL"):IF X=0THE
N 5560
5556 IFLEN(A$)-3>=LG THENA$=MID$
(A$,4):GOTO5030 ELSE C=(LG-LEN(A
$)+4)/2:A$=MID$(CT$,1,C)+MID$(A$
,4):GOTO5030
5560 X=INSTR(A$,";CE"):IF X=0THE
N5570
5561 IF LEN(A$)-3>=LG/2 THENA$=M
ID$(A$,4):GOTO5030
```

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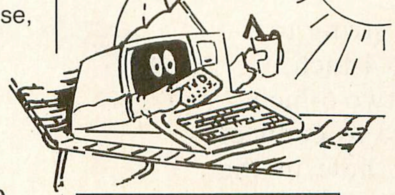

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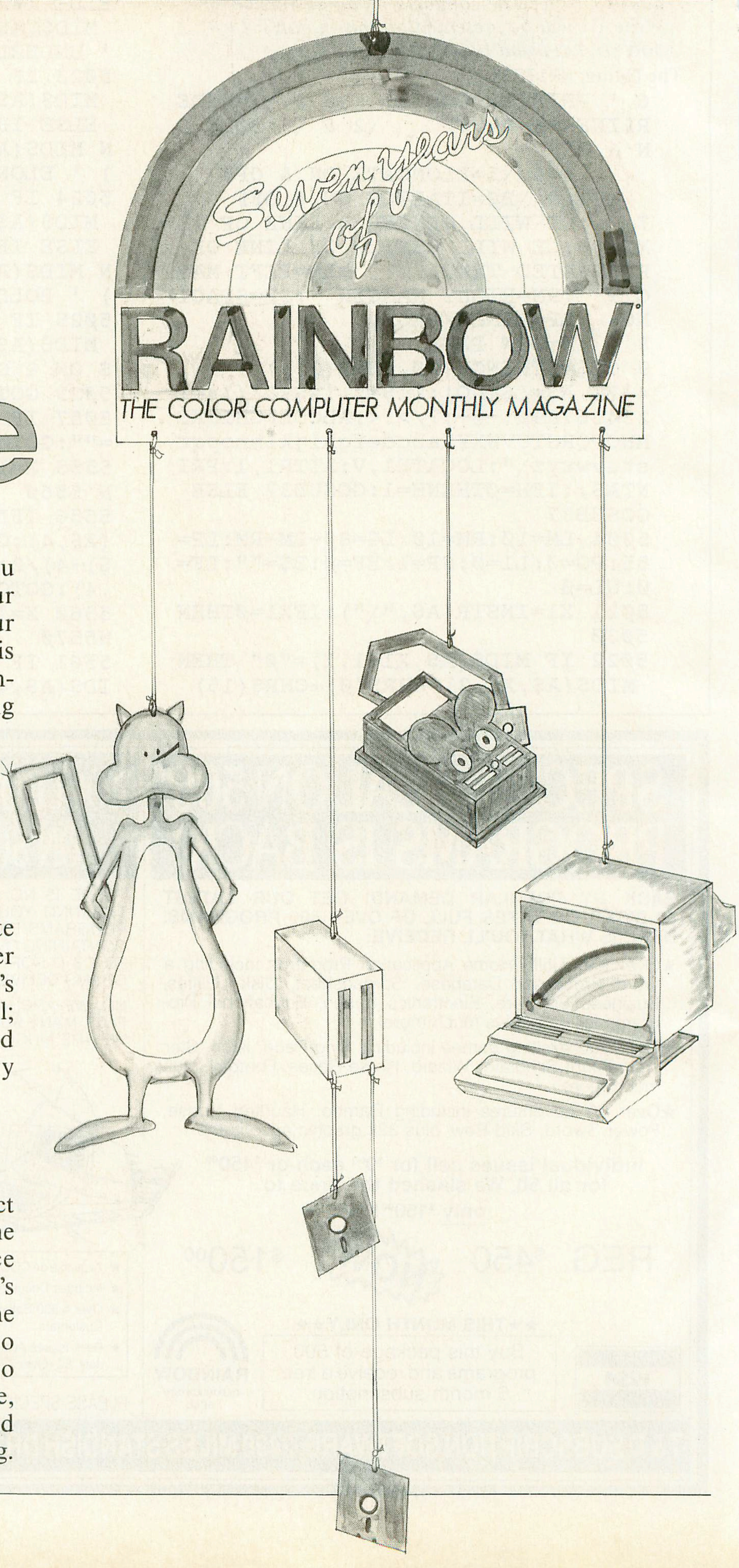
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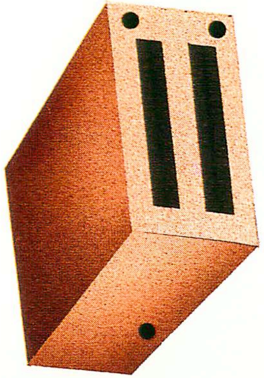
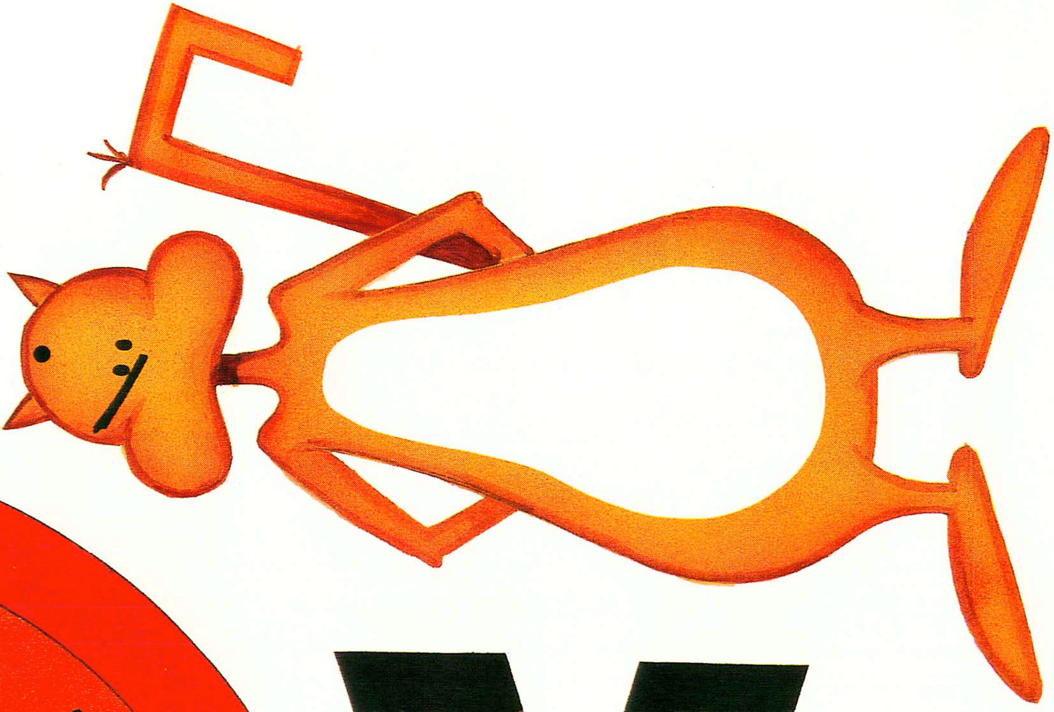
It's the July issue again, and do you know what that means? Yes, it's our birthday! And as usual when it's our birthday, we give *you* a present. This year it's a mobile to hang in your computer corner — a CoCo Mobile, starring our favorite feline, CoCo Cat.

It's easy to assemble. Just cut out the seven items and punch small holes where indicated. Use an X-acto knife for cutting out the figures if you're not very handy with scissors, because extracting CoCo Cat from the page requires some delicate surgery. You don't need to cut out inner spaces, like the area inside CoCo Cat's *arms* or inside Maxwell Mouse's tail; doing so might disturb the balance and give you a lopsided mobile — very embarrassing.

You'll need six pieces of string to tie it all together: a 7-inch, a 4-inch, a $3\frac{1}{4}$- inch, a $2\frac{1}{2}$-inch, and two 6-inch pieces. Use the 4-inch piece to connect CoCo Cat to the leftmost hole in the RAINBOW header. The 7-inch piece connects the disk drive to the header's second hole; the $2\frac{1}{2}$-inch and one of the 6-inch pieces connect the two disks to the drive. Maxwell Mouse connects to the third hole with the $3\frac{1}{4}$-inch piece, and the CoCo connects to the fourth and final hole with the 6-inch piece of string.





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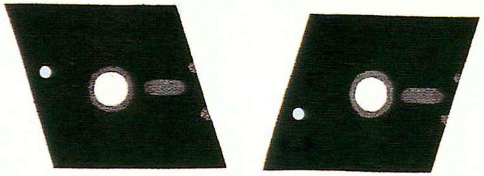

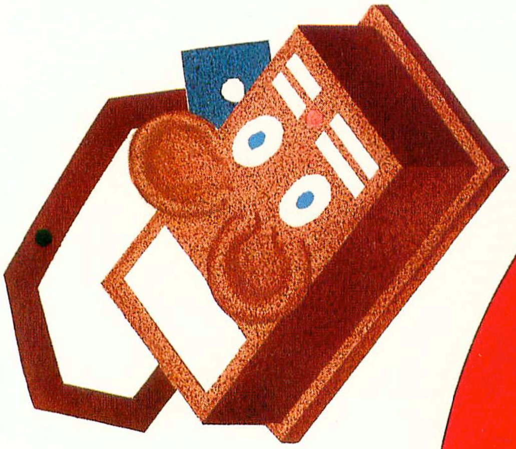

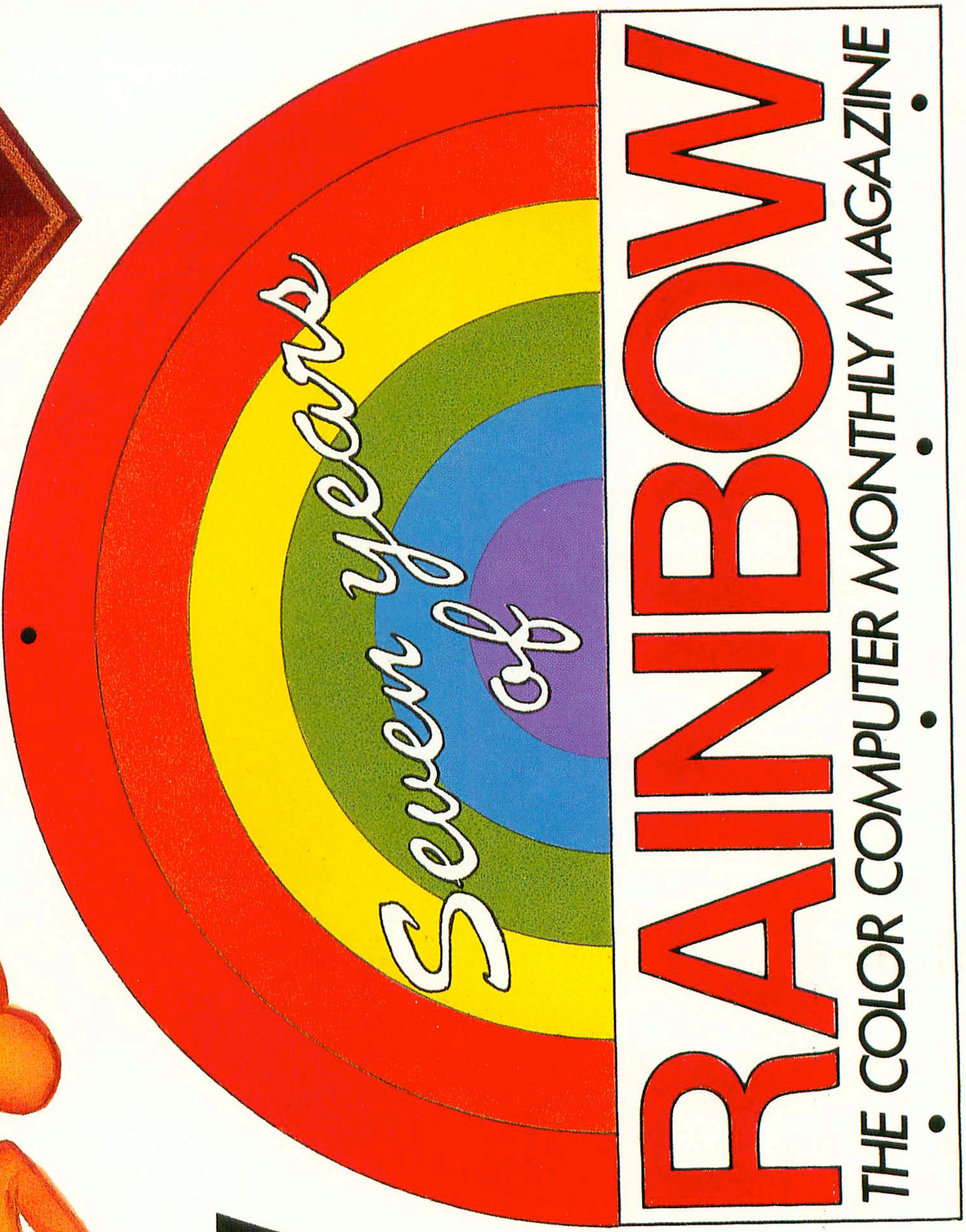
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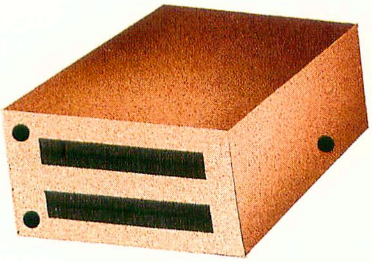

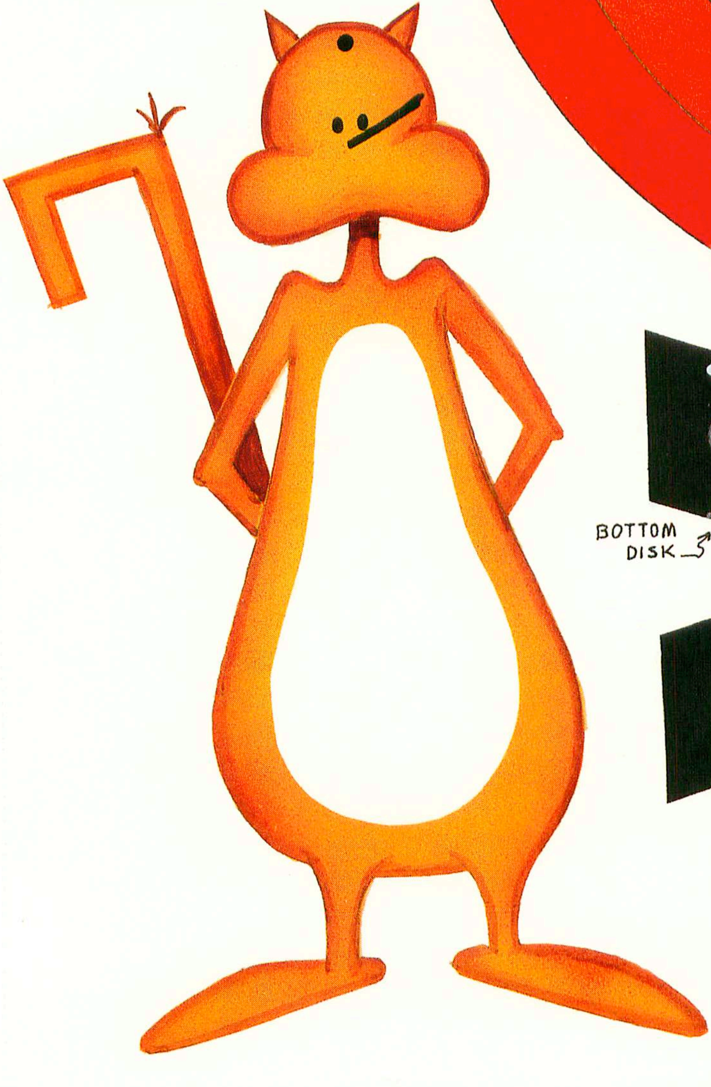

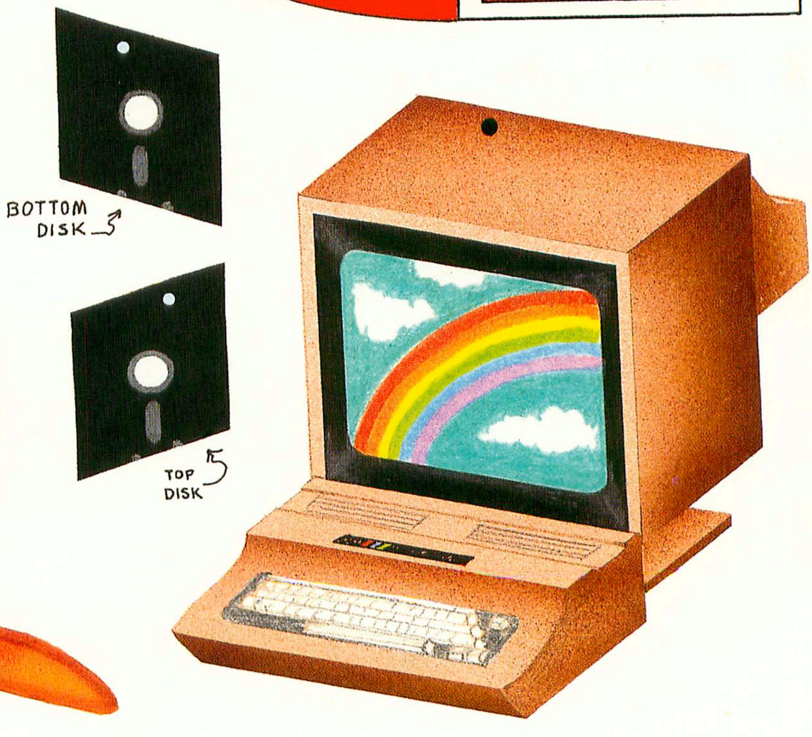
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The first in a series of tutorials for the beginner to intermediate machine language programmer

Machine Language Made BASIC

Part I: General Math

By William P. Nee

When I first started to learn machine language, setting up graphics seemed like a very complicated procedure. All those VDGs and SAMs were really discouraging. But then I realized that when you type in commands such as PMODE 4 or PCLS 2 or SCREEN 1,1, the computer must do something with those commands and numbers.

Why not find those same routines in ROM so you can just enter, for example, the PMODE numbers you want and then let the computer do all the work of setting the VDGs and SAMs? This series of articles is the result of several months of studying ROM routines to see where you can enter them, and it should help to make machine language programming a little more BASIC. These programs have been assembled with the *EDTASM+* cartridge.

In the next 13 articles, we'll use machine language for basic math functions: RND, PRINT, PRINT USING, PMODE, PSET, LINE, PLAY, etc. We'll make a "dump" program for a seven-dot printer, create music with six voices and wind up with a 3-D rotation program that includes perspective. Most of the machine language programs will have either an explanation or a BASIC program listing for comparison.

Many of these programs are written for ease of understanding rather than for maximum speed. You will find places where you can cut down on the number of commands and refine the program. Just be sure you understand how the whole program works before modifying it. Thanks to Adrian Kotik for debugging the programs and proofreading and assembling the articles.

Machine language is not a complicated language, just different. Commands are written in an abbreviated format such as LD for Load, ST for Store, SUB for Subtract, etc. Most numbers are written in Hex format, using the numerical Base 16; however, *EDTASM+* lets us use the more familiar Base 10, which we will be using in most of the programs. The $ prefix will indicate an address or location in Hex; #$ indicates a Hex number; # indicates a Base 10 number.

Bill Nee reversed the "snowbird" trend by retiring to Wisconsin from a banking career in Florida. He spends the long, cold winters writing programs for his CoCo.

All examples and methods are based on using *EDTASM+*. Be sure the computer is turned off before inserting the cartridge. Examples will usually originate (ORG) at Hex Location $3000 for compatability with either a 16K or 32K computer. Each example will end with SWI, although to *avoid* the End Error message, you may add an extra line by pressing TAB, typing END, pressing TAB again and typing START. If you do, the line after the ORG line should begin with something like START. Any listing you want to save on tape should have END START as the last line of the program.

The following examples will show how to add, subtract, multiply, and divide using machine language.

Example 1: Put the number 5 into Register A. Store the contents of Register A in Location $D0. Increase the contents of Location $D0 by 1. Load Register A with the contents of Location $D0. To put the program into memory, type A/IM/AO and let the program list to check for any errors; press Z to go to ZBUG, then type G3000. To check the result, press R to examine the registers. Register A now contains 6. The command INC can be used to add the number 1 to registers A, B or a memory location.

Example 1A: In this example, we load Register A with the number 5 and add to Register A (ADDA) the number 4. After running the program, examine the registers to see the result of 9 in Register A.

Example 2: This time the DEC command is used. The results show that DEC can be used to subtract the number 1 from registers A, B or a memory location. The commands INC and DEC are useful for the counting portion of your programs; however, most math problems are a little more complicated than 1 + 1.

Example 2A: The SUB command will subtract a number from Register A or Register B. In many cases, however, both registers A and B may contain numbers we need to use later.

The next six examples illustrate how to add, subtract, and multiply these two registers together.

Example 3: Load registers A and B with different numbers, save Register B in the S stack (PSHS B), add to Register A the contents of the S stack and increase the S stack pointer by 1 back to its original location (ADDA ,S+). When we look at Register A we see that it contains F instead of 15. This is the computer's way of displaying numbers in Base 16, or Hex. In Base 16, 10=A, 11=B, 12=C, 13=D, 14=E, 15=F and 16=10. So our answer of "F" is correct.

Example 4: The same procedure is used to subtract Register B from Register A.

Example 5: Another subtraction problem, but now when we look at Register A we see FB, not -5. The computer doesn't recognize negative numbers, it merely counts backwards from zero. The highest number that can be put into registers A or B is 255, or #$FF. Counting backwards from zero in Base 16 you, get #$FF, #$FE, #$FD, #$FC, #$FB, #$FA, etc. The fifth number counting backwards from zero is #$FB, so -5=#$FB.

Wait a minute — isn't #$FB also a positive number? Yes, in Base 10 it is (F*16)+B, or (15*16)+11=251. How does the computer — or operator — know which number is correct? In most math operations the computer will use "signed" numbers. If the left-most bit of an 8- or 16-bit number written in Base 2 is a 1, the number is considered to be negative; if it is a zero, the number is positive. So in registers A or B, numbers that appear to be greater than 127 may actually be negative numbers for math purposes.

In Example 5 our answer was #$FB. Since #$FB is greater than 127, we know the answer is actually a negative number. To use the "signed number check" you must convert #$FB in Hex to 11111011 in Base 2. (An easy way to convert Hex numbers to the Base 2 is to convert one Hex digit at a time. #$F equals 15, or 1111 in the Base 2; #$B equals 11 or 1011 in the Base 2, so #$FB=11111011.)

To prove that #$FB as a "signed" number is the same as -5, use the "Two's Compliment" procedure. Write the number in Base 2, reverse all the 0s to 1s and all the 1s to 0s, then add 1. In doing so, 11111011 becomes 00000100, and adding 1 gives us a result of 00000101. This equals 5, so our answer is -5!

Example 6: This time we loaded registers A and B each with a number and used `MUL` to multiply them. Since the result could be greater than the space available in just one register, we must read registers A and B together all as one number. Registers A and B together are called Register D, although the D does not appear on the screen. Examine Register D (A and B) to find the answer $32, which is 3*16+2, or 50.

Example 7: In this example, we have to read all of Register D to find an answer of $2710, which is (2*16)**3 + (7*16)**2 + 1*16 + 0, or 10000. (** is used here as a symbol for exponential.)

Example 8: Before we check the answer, an important point to remember is that `MUL` does not use "signed" numbers. So when we try to put in -100 or #$9C, the computer uses #$9C=156 and multiplies that by 100. The answer of Hex 3CF0 in Register D is 15600. Even larger numbers can be multiplied by using a ROM subroutine at Address $9FB5.

Example 9: Load Register D with a Hex number and Register X with another Hex number. Jumping to the subroutine at $9FB5 (JSR $9FB5) will put the product of Register D times Register X in Register Y and Register U. If we read Register Y and Register U together, the product is $06260060. You can check the result this time by converting the answer to the Base 10. Does this subroutine work with negative numbers?

So far, we've been working only with whole numbers, but that rarely occurs in math. The computer has two locations where it stores numbers up to nine digits long, including positive and negative numbers. These locations are called Floating Point Accumulator 1 and 2, or FP1 and FP2. To get a "signed" number from Register D to FP1, use the ROM routine at Address $B4F4; to get a number from FP1 back to Register D, use the routine at $B3ED. Remember, Register D can only hold a whole number.

Example 1

```
ORG     $3000
LDA     #5
STA     $D0
INC     $D0
LDA     $D0
SWI
```

Example 1A

```
ORG     $3000
LDA     #5
ADDA    #4
SWI
```

Example 2

```
ORG     $3000
LDA     #5
STA     $D0
DEC     $D0
LDA     $D0
SWI
```

Example 2A

```
ORG     $3000
LDA     #5
SUBA    #4
SWI
```

Example 3

```
ORG     $3000
LDA     #10
LDB     #5
PSHS    B
ADDA    ,S+
SWI
```

Example 4

```
ORG     $3000
LDA     #10
LDB     #5
PSHS    B
SUBA    ,S+
SWI
```

Example 5

```
ORG     $3000
LDA     #5
LDB     #10
PSHS    B
SUBA    ,S+
SWI
```

Example 6

```
ORG     $3000
LDA     #5
LDB     #10
MUL
SWI
```

Example 7

```
ORG     $3000
LDA     #100
LDB     #100
MUL
SWI
```

Example 8

```
ORG     $3000
LDA     #-100
LDB     #100
MUL
SWI
```

Example 9

```
ORG     $3000
LDD     #$1234
LDX     #$5678
JSR     $9FB5
SWI
```

Certain numbers already stored in the computer's memory that are used to perform internal calculations and their locations are:

Number	Location
-0.50	$843C
0.25	$BFC2
0.50	$BEC0
1.00	$BAC5
10.00	$BB7D

Each number is five bytes long and is in floating point format.

To handle internal calculations, the computer has five ROM routines that add, subtract, multiply, or divide. The

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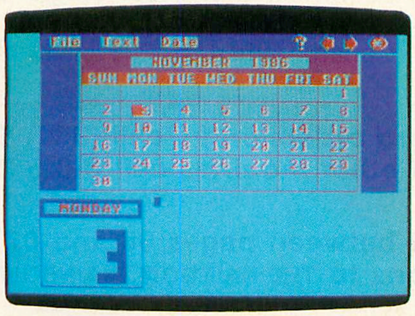

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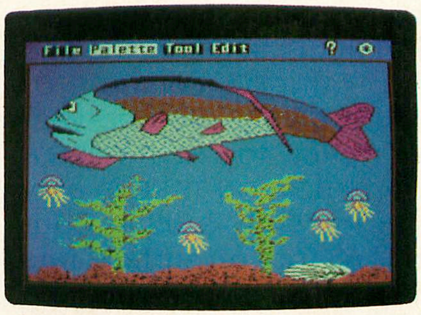

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symbol X means "the number at Location X." These routines are:

Function	Address
FP1=(X)+FP1	$B9C2
FP1=(X)-FP1	$B9B9
FP1=(X)*FP1	$BACA
FP1=(X)/FP1	$BB8F
FP1=FP2/(X)	$BB88

Example 10: Load Register D with the number 6, put that in FP1 (JSR $B4F4); load Register X with the location of the number 10 (LDX #$BB7D), add the number at the location in Register X to FP1 (JSR $B9C2). Transfer the result back to Register D (JSR $B3ED). Examine the register to find Register D is Hex 10, or 16.

Example 11: Use the routine at $B9B9 to subtract FP1 from the number at the location in Register X.

Example 12: The routine at $BACA is used to multiply the number at the location in Register X by FP1. The answer of 3C in Register D is 60.

Example 13: The routine at $BB8F divides the number at the location in Register X by FP1. Since Register D can only hold whole numbers, it shows a 1. The complete answer is in FP1, so we need a routine to display the entire answer instead of rounding it off to Register D. By using a combination of ROM routines, we can display the complete answer, including negative numbers, up to nine digits. (Putting a number back into Register D will lose the number in FP1.)

Example 13A: Type and run this example to see the entire

Example 10

```
ORG     $3000
LDD     #6
JSR     $B4F4
LDX     #$BB7D
JSR     $B9C2
JSR     $B3ED
SWI
```

Example 11

```
ORG     $3000
LDD     #6
JSR     $B4F4
LDX     #$BB7D
JSR     $B9B9
JSR     $B3ED
SWI
```

Example 12

```
ORG     $3000
LDD     #6
JSR     $B4F4
LDX     #$BB7D
JSR     $BACA
JSR     $B3ED
SWI
```

Example 13

```
ORG     $3000
LDD     #6
JSR     $B4F4
LDX     #$BB7D
JSR     $BB8F
JSR     $B3ED
SWI
```

Example 13A

```
ORG     $3000
LDD     #6
JSR     $B4F4
LDX     #$BB7D
JSR     $BB8F
JSR     $BDD9
LEAX    -1,X
JSR     B99C
JSR     $B958
SWI
```

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answer displayed with all nine digits (and in the Base 10). The following routines are used in this example:

Function	Address
Transfer FP1 to a buffer at $3DA	$BDD9
Decrease location for sign	LEAX -1,X
Print buffer contents	$B99C
Print a carriage return	$B958

The main FP routines are:

Function	Address
Transfer FP1 to FP2 (and FP1)	$BC5F
Transfer FP2 TO FP1 (and FP2)	$BC4A
Register B (-128 to +127) to FP1	$BC7C
Register B (-128 to +127) + FP1	$BD99
Register D (-32768 to +32767) to FP1	$B4F4
(X) to FP1	$BC14
(X) to FP2	$BB2F
FP1 to (X)	$BC35
10*FP1	$BB6A
-1*FP1	$BEE9
FP1/10	$BB82
FP2/FP1	$BB91

Some other numbers stored in the computer's memory are:

Number	Location
-32768	$B3DF
PI/2	$83AB
2*PI	$BFBD or $BFE1
SQR(2)/2	$8432
SQR(2)	$8437
LOG(2)	$8441

The $B4F4 routine is used in most function commands. Once a number is in FP1, you can jump to the routine for any of the following:

Function	Location
SIN	$BF78
COS	$8378
TAN	$8381
SQR	$8480
EXP	$84F2
LOG	$8446
RND	$BF1F
INT	$BCCE

You can print the results in FP1 or use the routine at $B3ED to put the results back in Register D, but only as a whole number. For practice, develop a machine language program that will print the SIN of any angle you load into Register D. Remember, angles must be converted to radians, since trigonometric functions in the Color Computer are in radians. (Hint: one degree = 2*PI/360 radians.)

Now for our comparison programs. Both will perform a sort of numbers and graphics from screen locations &H400 to &H5FF. You may want to time each program. Is there a difference in the random portion? Is there much difference in the sorting portion? We will review these programs in the next article. Meanwhile, try making up your own programs using the ROM routines we've discussed.

(Questions or comments concerning this tutorial may be directed to the author at Route 2, Box 216C, Mason, WI 54856-9302. Please enclose an SASE when requesting a reply.) ☐

Listing 1: `SORTBAS`

```
110 CLS
120 FOR X=&H400 TO &H5FF
130 POKE X,RND(255)
180 NEXT
200 FLAG=1
220 FOR X=&H400 TO &H5FE
230 A=PEEK(X):B=PEEK(X+1)
250 IF A<=B THEN 300
270 TEMP=A:A=B:B=TEMP
280 POKE X,A:POKE X+1,B
290 FLAG=0
300 NEXT
320 IF FLAG=0 THEN 200
340 A$=INKEY$:IF A$="" THEN 340
370 END
```

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Listing 2: `SORTBIN`

```
3000                00100        ORG    $3000
3000 BD   A928      00110 START  JSR    $A928           110 CLS
3003 108E 0400      00120        LDY    #$400           120 FOR X=&H400 TO &H5FF
3007 CC   00FF      00130 LOOP1  LDD    #255            130 POKE X,RND(255)
300A BD   B4F4      00140        JSR    $B4F4
300D BD   BF1F      00150        JSR    $BF1F
3010 BD   B3ED      00160        JSR    $B3ED
3013 E7   A0        00170        STB    ,Y+
3015 108C 05FF      00180        CMPY   #$5FF           180 NEXT
3019 23   EC        00190        BLS    LOOP1
301B 86   01        00200 SORT   LDA    #1              200 FLAG=1
301D B7   3040      00210        STA    FLAG
3020 8E   0400      00220        LDX    #$400           220 FOR X=&H400 TO &H5FE
3023 EC   80        00230 LOOP2  LDD    ,X+             230 A=PEEK(X):B=PEEK(X+1)
3025 34   04        00240        PSHS   B
3027 A1   E0        00250        CMPA   ,S+             250 IF A<=B THEN 300
3029 23   07        00260        BLS    CONT
302B 1E   89        00270        EXG    A,B             270 TEMP=A:A=B:B=TEMP
302D ED   1F        00280        STD    -1,X            280 POKE X,A:POKE X+1,B
302F 7F   3040      00290        CLR    FLAG            290 FLAG=0
3032 8C   05FE      00300 CONT   CMPX   #$5FE           300 NEXT
3035 23   EC        00310        BLS    LOOP2
3037 7D   3040      00320        TST    FLAG            320 IF FLAG=0 THEN 200
303A 27   DF        00330        BEQ    SORT
303C BD   ADFB      00340        JSR    $ADFB           340 A$=INKEY$:IF A$="" THEN 340
303F 3F             00350        SWI
3040                00360 FLAG   RMB    1
          3000      00370        END    START           370 END

00000 TOTAL ERRORS
```

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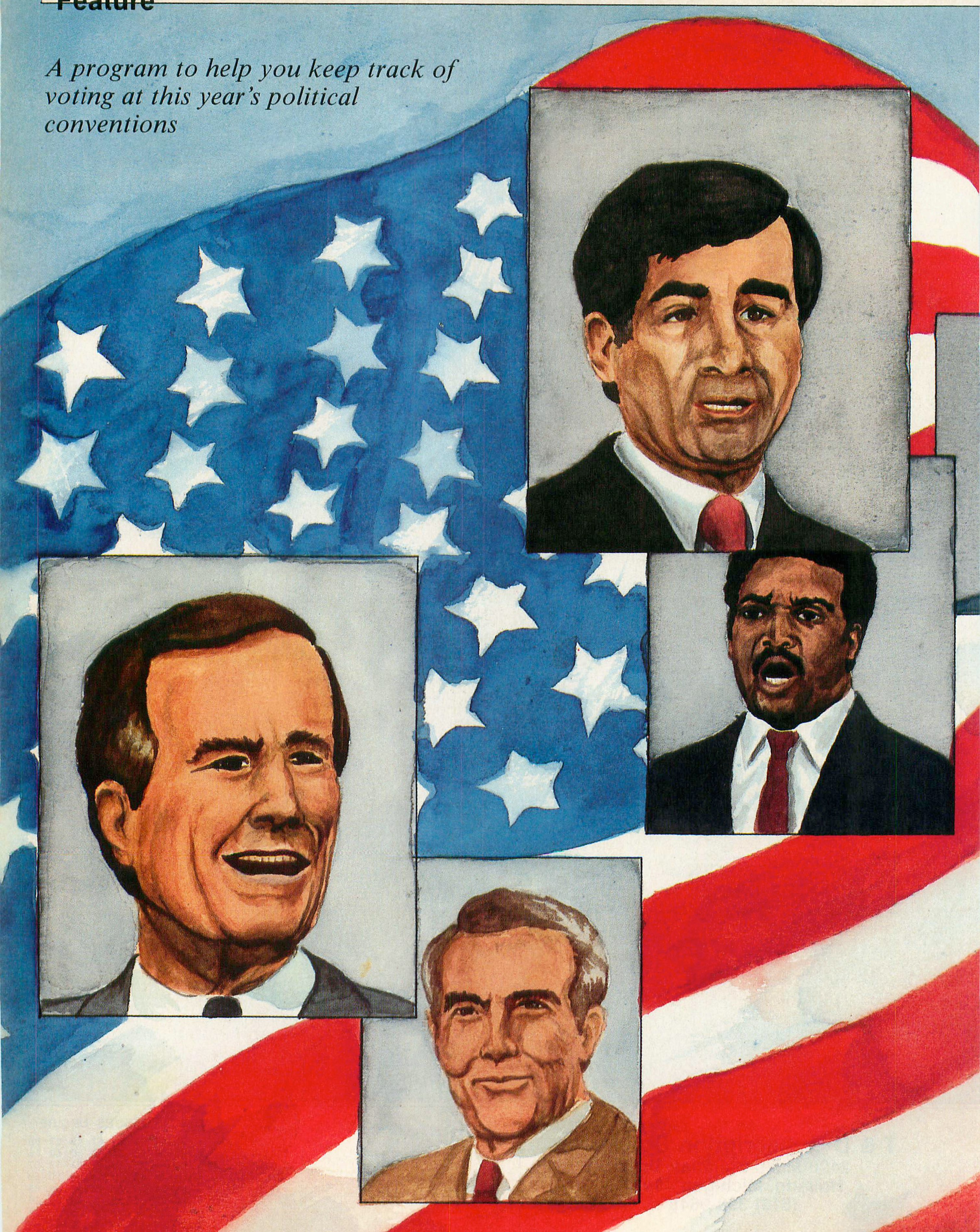
A program to help you keep track of voting at this year's political conventions



32K Disk 32K ECB Modification

Convention!

By Leonard Hyre

Unpack the bunting, inflate the balloons, shred the confetti and rehearse the music for "Happy Days Are Here Again" and "Hail to the Chief"! Post the No Vacancy signs, tidy the public areas and lower the air conditioner thermostats! Atlanta and New Orleans are checking off these and countless other items on their things-to-do lists as the Democratic and Republican National Conventions head south.

Amid the hype and hoopla — not to mention the fun of watching convention delegates from across the United States and its territories and possessions revert to silly behavior they probably haven't practiced since they were teenagers — Americans will gather in front of their television sets to witness that quadrennial rite of presidential politics: choosing the nominees. This convention season promises to be the most exciting one in years, with the identity of at least one of the nominees, as well as both running mates, still uncertain as we go to press.

In anticipation of the Democrats' meeting July 18th through 21st and the Republicans' from the 15th until the 18th of August, THE RAINBOW is pleased to present Leonard Hyre's program Convention. *We think you'll find it not only an intriguing way of testing your own predictive powers but also a means of involving the members of your family in a project that's fun as well as educational. For example, prior to the conventions each family member might predict state-by-state the number of votes a particular candidate will garner; these predictions could be printed out and used for comparison with the actual outcome of the convention voting, with some sort of prize for the winning political prognosticator. Or, on a more elementary level, you might want to use the program's delegate count as a tool for teaching younger family members something about state sizes in terms of population.*

However you choose to use it, Convention *is guaranteed to stimulate your own and your family's interest in the selection of each party's nominees for the 41st president and vice president of the United States. And be sure to watch for the November RAINBOW, where we'll feature a follow-up article and another timely Hyre program —* Election*!*

Wild, unpredictable, exasperating, exhilarating, and one thing for sure — it's an American original. We can only be talking about one thing, the political convention. Not perfect, to be sure, but assuredly the best way of picking a leader that this nation has come up with so far!

Comes the Republican or Democratic convention, many of you, like me, will find yourselves glued in front of the television, immersed in American politics. This program, *Convention*, is written with the thought of adding some extra enjoyment to that viewing.

First and foremost, *Convention* keeps track of the votes. After all, that is the name of the game. A state's vote for each candidate is entered during the state roll calls. The program keeps track of total votes per candidate and votes per state per candidate, prints out detailed round-by-round reports, saves the data at any point and allows reloading of previously saved files.

After the title screen, the user selects either Democratic or Republican party, then is presented with the main menu. Three options are given the user.

The first option is Enter Votes; naturally, this is the heart of the whole program. You will be asked to enter a state or territory by abbreviation. Candidates' names are constantly displayed down the left side of the screen. When a state is selected, votes for each candidate are shown in the middle column as a grand total and to the right as his votes from this state. As state votes change, both columns will be updated. To exit the voting section, just enter `XX` at the state prompt. You will be returned to the main menu.

Output to the printer is the subject of the second option on the main menu. Two choices are given. The first choice is for a complete detailed report. This printout will list all of the states and territories and show votes given for each candidate across the sheet. After all states and territories are listed, a vote total is printed, followed by a legend relating candidate numbers to specific candidates. In addition, a printout of the states and territories with their proper abbreviations is included. The other printer option is strictly for a list of states and abbreviations. This will likely be used only once, to print yourself a handy reference to work with. Choice 3 will again return you to the main menu.

> ***"Prior to the conventions each family member might predict state-by-state the number of votes a particular candidate will garner; these predictions could be printed out and used for comparison with the actual outcome of the convention voting."***

File saving and retrieving is the third choice offered. It might be interesting to save the voting status at various points in the proceedings — for example, after each roll call is completed. You may choose to save the file at any point, however. Data saved includes title, party choice and all votes per candidate per state. At any time you want, you can load the data back into memory for further rounds of voting, or for reports.

I have included lists with all the contending Republican and Democratic leaders. If you would like to follow along with the vice presidential selection process, simply change the `DATA` lines listing candidates to reflect the new contenders. For ease of modification, make sure each list contains six entries, even if some are "None" or "Other." My suggestion is that you put copies of the program on two separate disks, Democrat and Republican.

The program structure of *Convention* revolves around the basic problem of controlling "who has how many votes and from which state did they come." The two-dimension array `V(6,53)` represents votes (candidates, states and territories), and is the key to the whole program. For those of you new to computing and interested in learning programming in BASIC, the manipulation of this array in the program offers a practical example of usage of multi-dimensional arrays.

To make understanding the program easier, I have tried to provide explanatory `REM` statements within the listing. A red, white and blue title screen seemed appropriate, so the first few lines of the program handle that task. All necessary `DATA` statements are then read into computer memory. The "working" screen is then created (lines 700 through 800) and a menu presented (lines 830 through 900). A small but important subroutine to clear the input and menu areas is located at lines 930 through 940.

Printer routines are very generic and should run on most any printer without causing problems. Lines 980 through 1380 encompass all printer functions. These lines are self-explanatory and should be easy to follow in the listing.

Vote entry and processing is handled by two routines, the first being state selection. Lines 1420 through 1490 get the state abbreviation, check it for validity and update that state's vote per candidate column. Vote entries are controlled with lines 1530 through 1610. The candidate's "old" number of votes from the current state is subtracted (Line 1550) prior to adding the "new" vote (Line 1590).

Very simple load (lines 1750 through 1850) and save (lines 1890 through 1960) routines handle all of the input/output of voting data. [See the Editor's Note that appears before the listing for modifications for cassette use.] You may assign filenames of your choice, but do not include an extension. Line 1810 in the load routine makes sure you are not loading a Republican data file into a Democratic convention, and vice versa.

Typing in *Convention* should not present too much of a challenge for you. Be very careful with the `DATA` statements, as errors here are often tricky to locate. Don't forget, the program is also available through Delphi and on RAINBOW ON TAPE and DISK.

Enjoy using *Convention* — I hope "your" candidate wins!

(Questions or comments concerning this program may be directed to the author at P.O. Box 403, Cambridge, MD 21613. Please enclose an SASE when requesting a reply.) ☐

Leonard Hyre is the author of Federal Hill Software's Handicapper *series and a number of articles for RAINBOW. He also published several articles in RAINBOW's sister publication, PCM, and is the author of* Sanyopoly, *a new Sanyo game from Michigan Software.*

Editor's Note: In order to run CONVENTN *on a cassette-based system, delete lines 1770 and 1910 and substitute the following lines for those shown in Listing 1. For your convenience, the modified cassette version of* CONVENTN *will be included on this month's RAINBOW ON TAPE.*

```
1790 OPEN "I", #-1, NM$
1800 INPUT #-1, SVFLAG
1810 IF SVFLAG <> FLAG THEN CLOS
E #-1: GOSUB 930:PRINT@96,"WRONG
 PARTY...LOAD ABORTED";:FOR DL=1
 TO 1200:NEXT DL:SOUND 150,1:GOT
O 800
1820 FOR CAND = 1 TO 6: FOR PL =
 1 TO 53: INPUT #-1, V(CAND, PL)
: CT(CAND) = CT(CAND) + V(CAND,
PL): NEXT PL: NEXT CAND
1830 CLOSE #-1
1920 OPEN "O", #-1, NM$
1930 SVFLAG = FLAG: PRINT #-1, S
VFLAG
1940 FOR CAND=1TO6:FORPL=1TO53:P
RINT #-1,V(CAND,PL):NEXTPL:NEXTC
AND
1950 CLOSE #-1
```

175	218	1290	160
350	200	1350	108
590	87	1540	165
770	34	1670	117
1000	81	1820	22
1120	96	END	128

The listing: CONVENTN

```
10 '****************************
20 '*       CONVENTION-        *
30 '*  AN AMERICAN ORIGINAL    *
40 '*  (C) 1988  BY L. HYRE    *
50 '*    CAMBRIDGE, MD, USA    *
60 '****************************
70 '
80 ' ****** COCO VERSION ******
90 '
100 '*** PROGRAM INITIALIZE ***
110 '
120 DIM LS$(53), S$(53), S(53),
C$(6), C(6), V(6, 53), RC$(6), D
C$(6), TEST$(53)
130 FLAG = 0
139 '
141 '
150 CLS5:PRINT STRING$(64,175);
```

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```
160 RD$=CHR$(159)+CHR$(159):WH$=
CHR$(207)+CHR$(207)
165 BN$=RD$+WH$+RD$+WH$+RD$+WH$+
RD$+WH$:BN$=BN$+BN$
170 FOR X=1 TO 13:PRINT BN$;:NEX
T
172 GR$=STRING$(12," ")
174 PRINT@170,GR$;:PRINT@202,GR$
;CHR$(128);:PRINT@234,GR$;CHR$(1
28);:PRINT@266,GR$;CHR$(128);:PR
INT@298,GR$;CHR$(128);
175 PRINT@331,STRING$(12,128);
176 PRINT@203,"CONVENTION";:PRIN
T@239,"AN";:PRINT@268,"AMERICAN"
;:PRINT@300,"ORIGINAL";
177 PRINT@496,"<PRESS ANY KEY>";
178 AK$=INKEY$:IF AK$=""THEN 178
250 '
260 '** READ IN STATES ETC **
270 '
280 DATA ALABAMA,AL,1,ALASKA,AK,
2,ARIZONA,AZ,3
290 DATA ARKANSAS,AR,4,CALIFORNI
A,CA,5,COLORADO,CO,6,CONNECTICUT
,CN,7
300 DATA DELAWARE,DE,8,DIST of C
OLUMBIA,DC,9,FLORIDA,FL,10,GEORG
IA,GA,11
310 DATA HAWAII,HI,12,IDAHO,ID,1
3,ILLINOIS,IL,14
320 DATA INDIANA,IN,15,IOWA,IO,1
6,KANSAS,KS,17,KENTUCKY,KY,18,LO
UISIANA,LA,19
330 DATA MAINE,ME,20,MARYLAND,MD
,21,MASSACHUSETTS,MA,22,MICHIGAN
,MI,23
340 DATA MINNESOTA,MN,24,MISSISS
IPPI,MS,25,MISSOURI,MO,26,MONTAN
A,MT,27
350 DATA NEBRASKA,NE,28,NEVADA,N
V,29,NEW HAMPSHIRE,NH,30,NEW JER
SEY,NJ,31
360 DATA NEW MEXICO,NM,32,NEW YO
RK,NY,33,NORTH CAROLINA,NC,34,NO
RTH DAKOTA, ND,35
370 DATA OHIO,OH,36,OKLAHOMA,OK,
37,OREGON,OR,38
380 DATA PENNSYLVANIA,PA,42,PUER
TO RICO,PR,43,RHODE ISLAND,RI,44
390 DATA SOUTH CAROLINA,SC,42,SO
UTH DAKOTA,SD,43,TENNESSEE,TN,44
,TEXAS,TX,45
400 DATA UTAH,UT,46,VERMONT,VT,5
7,VIRGINIA,VA,48,VIRGIN ISLANDS,
VI,49
410 DATA WASHINGTON,WA,50,WEST V
IRGINIA,WV,51,WISCONSIN,WI,52,WY
OMING,WY,53
420 '
430 '*** CANDIDATES ***
440 '
```

```
450 DATA DUKAKIS,JACKSON,GEPHARD
T,GORE,SIMON,OTHER
460 DATA ROBERTSON,BUSH,DOLE,KEM
P,HAIG,OTHER
470 '
480 '*** SETUP SCREEN HERE ***
490 '
500 PMODE 0:CLS
510 '
570 ' READ STATES & CANDIDATES
580 '
590 FOR X = 1 TO 53: READ LS$(X)
, S$(X), S(X): NEXT
600 FOR X = 1 TO 6: READ DC$(X):
 NEXT: FOR X = 1 TO 6: READ RC$(
X): NEXT
610 '
650 PRINT@6,"C O N V E N T I O N
":PRINT STRING$(32,175);:PRINT@1
60,STRING$(32,159);
680 '****** CHOOSE CONVENTIONS
690 '
700 PRINT@64,"CHOOSE PARTY....":
PRINT"<D>EMOCRAT OR <R>EPUBLIC";
:INPUT PR$
710 IF PR$ = "D" OR PR$ = "d" TH
EN FLAG = 1: GOTO 740
720 IF PR$ = "R" OR PR$ = "r" TH
EN FLAG = 2: GOTO 750
730 GOTO 700
740 FOR X = 1 TO 6: C$(X) = DC$(
X): C(X) = X: NEXT: GOTO 760
750 FOR X = 1 TO 6: C$(X) = RC$(
X): C(X) = X: NEXT: GOTO 760
760 PRINT@193,"CANDIDATE":PRINT@
208,"TOTAL":PRINT@219,"STATE":SS
=224:FOR X=1 TO 6:PRINT@SS,C(X);
">";C$(X):SS=SS+32:NEXT
770 IF FLAG=1 THEN PRINT@480,"TO
TAL=4162  NEEDED=2082";
780 IF FLAG=2 THEN PRINT@480,"TO
TAL=2277  NEEDED=1139";
800 FOR DL=1 TO 490:NEXT:GOSUB 9
30
810 '
820 '*** MAIN MENU ***
821 '
830 PRINT@64,"SELECTION MENU..."
840 PRINT"1>VOTES  2>PRINTER  3>
SAVE/LOAD"
850 AK$ = INKEY$: IF AK$ = "" TH
EN 850
860 IF AK$ = "1" THEN 1420
870 IF AK$ = "2" THEN 980
880 IF AK$ = "3" THEN 1650
890 GOTO 850
900 GOTO 900
908 '
910 '*** CLEAR INPUT AREA ***
920 '
930 FOR WP=64 TO 128 STEP 32:PRI
```

```
NT@WP, STRING$(32," ");:NEXT WP
940 RETURN
950 '
960 '*** PRINTER ROUTINES ***
970 '
980 GOSUB 930
990 PRINT@64,"PRINTED INFORMATIO
N AVAILABLE.."
991 '
1000 PRINT@96,"<make sure printe
r is on>":PRINT@128,"1>REPORT 2
>ST.ABBREV.  3>MENU"
1001 '
1010 AL$ = INKEY$: IF AL$ = "" T
HEN 1010
1020 IF AL$ = "1" THEN 1190
1030 IF AL$ = "2" THEN 1090
1040 IF AL$ = "3" THEN 800
1050 GOTO 1010
1060 '
1070 '* PRINT OUT STATES *
1080 '
1090 GOSUB 930: PRINT #-2, "Abbr
eviations Of States, Territories
, and District Of Columbia.": PR
INT #-2, STRING$(80, "_")
1100 FOR P = 1 TO 27
1110 IF P < 10 THEN PRINT #-2, "
0"; RIGHT$(STR$(S(P)), 1); "> ";
 S$(P); "-"; LS$(P); : PRINT #-2
, TAB(40); S(P + 27); ">"; S$(P
+ 27); "-"; LS$(P + 27): GOTO 11
30
1120 PRINT #-2, RIGHT$(STR$(S(P)
), 2); "> "; S$(P); "-"; LS$(P);
 : IF (P + 27) = 54 THEN PRINT #
-2,"": ELSE PRINT #-2, TAB(40);
S(P + 27); ">"; S$(P + 27); "-";
 LS$(P + 27)
1130 NEXT P
1140 IF TF = 1 THEN GOTO 1380
1150 GOTO 800
1160 '
1170 '*** PRINTER REPORT ****
1180 '
1190 GOSUB 930:PRINT@64,"PRINTER
 OPERATIONS....":PRINT@96,"IS P
RINTER READY <Y/N>";:INPUT YN$
1200 IF YN$ = "Y" OR YN$ = "y" T
HEN 1220
1210 SOUND 200,1:GOSUB 930:GOTO
830
1220 PRINT@128,"ENTER TITLE ";:I
NPUT RT$
1230 IF FLAG = 1 THEN PT$ = "DEM
OCRATIC PARTY" ELSE PT$ = "REPUB
LICAN PARTY"
1240 SR = 40 - INT(LEN(RT$) / 2)
```

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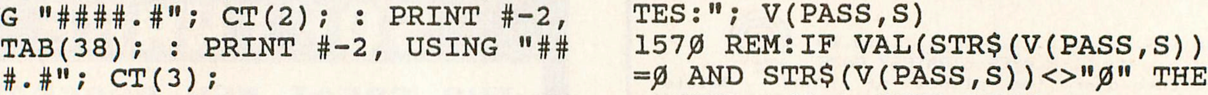
(SINCE 1985)

```
: PRINT #-2, STRING$(SR, " "); R
T$: PRINT #-2, STRING$(80, "_")
1250 PRINT #-2, PT$; "-Current C
ONVENTION Status Report-" : PRIN
T #-2, STRING$(80, "_")
1260 PRINT #-2," CANDIDATES:";:T
B=15:FOR X=1 TO 6:PRINT #-2,TAB(
TB+(9-LEN(C$(X))));C$(X);:TB=TB+
10:NEXT X:PRINT #-2
1270 PRINT #-2, STRING$(80, "_")
1280 FOR REPORT = 1 TO 53
1290 PRINT #-2, LS$(REPORT); : P
RINT #-2, TAB(18); : PRINT #-2,
USING "####.#"; V(1, REPORT); :
PRINT #-2, TAB(28); : PRINT #-2,
 USING "####.#"; V(2, REPORT); :
 PRINT #-2, TAB(38); : PRINT #-2
, USING "####.#"; V(3, REPORT);
1300 PRINT #-2, TAB(48); : PRINT
 #-2, USING "####.#"; V(4, REPOR
T); : PRINT #-2, TAB(58); : PRIN
T #-2, USING "####.#"; V(5, REPO
RT); : PRINT #-2, TAB(68); : PRI
NT #-2, USING "####.#"; V(6, REP
ORT)
1310 IF REPORT=45 THEN FOR SK=1
TO 15:PRINT #-2,"":NEXT SK
1320 NEXT REPORT
1330 PRINT #-2, STRING$(80, "_")
1340 PRINT #-2, "TOTAL VOTES=";
: PRINT #-2, TAB(18); : PRINT #-
2, USING "####.#"; CT(1); : PRIN
T #-2, TAB(28); : PRINT #-2, USI
NG "####.#"; CT(2); : PRINT #-2,
 TAB(38); : PRINT #-2, USING "##
##.#"; CT(3);
1350 PRINT #-2, TAB(48); : PRINT
 #-2, USING "####.#"; CT(4); : P
RINT #-2, TAB(58); : PRINT #-2,
USING "####.#"; CT(5); : PRINT #
-2, TAB(68);:PRINT #-2,USING "##
##.#";CT(6):PRINT#-2,STRING$(80,
" ")
1370 PRINT #-2, STRING$(80, "_")
: TF = 1: GOTO 1090
1380 TF = 0: FOR X=1 TO 26:PRINT
#-2,"":NEXT:GOSUB 930: GOTO 830
1390 '
1400 '******* GET STATE/TERRITOR
Y FROM USER
1410 '
1420 GOSUB 930:PRINT@64,"VOTE IN
PUT..":PRINT@85,"XX=MENU";:PRINT
@96,"INPUT STATE ABBREVIATION:";
:INPUT ST$
1440 IF ST$ = "XX" THEN GOSUB 93
0: GOTO 830
1450 FOR TEST = 1 TO 53: IF ST$
= S$(TEST) THEN 1480
1460 NEXT TEST
1470 PRINT@128,"INCORRECT ABBREV
IATION!-SEE LIST";:FOR DL=1 TO 1
500:NEXT:SOUND 100,1:GOTO 1420
1480 GOSUB 930:PRINT@64,"VOTES F
ROM ";LS$(TEST):S=TEST
1490 SS=250:FOR PRIOR=1 TO 6:PRI
NT@SS,;:PRINT USING"####.#";V(PR
IOR,S);:SS=SS+32:NEXT PRIOR
1500 '
1510 '*** GET VOTES ***
1520 '
1530 SS=241:FOR PASS = 1 TO 6
1540 PRINT@96,STRING$(32," ");:P
RINT@96,"VOTES FOR CANDIDATE ";C
$(PASS)
1550 CT(PASS) = CT(PASS) - V(PAS
S, S)
1560 PRINT@128,;:INPUT "INPUT VO
TES:"; V(PASS,S)
1570 REM:IF VAL(STR$(V(PASS,S)))
=0 AND STR$(V(PASS,S))<>"0" THEN
 SOUND 100,1:GOTO 1560
1590 CT(PASS)=CT(PASS)+V(PASS,S)
:PRINT@SS,;:PRINT USING"####.#";
CT(PASS);:SX=SS+9:PRINT@SX,;:PRI
NT USING"####.#";V(PASS,S);:SS=S
S+32
1600 PRINT@128,STRING$(32," ");:
NEXT PASS
1610 GOTO 1420
```

Dr. Nibble

By Kelly Taylor


WHAT'S WRONG, CHICKLET?
IT'S NOT FAIR, DR. NIBBLE. I GOT 10 POINTS OFF JUST FOR LEAVING OUT A DUMB SEMI-COLON
IN COMPUTER LANGUAGE, PUNCTUATION IS AS IMPORTANT AS WORDS. WHY, IN THE EARLY DAYS OF COMPUTING, A PROBE TO VENUS WAS CONTROLLED BY A PROGRAM. BECAUSE THE PROGRAMER INSERTED A SEMI-COLON INSTEAD OF A COMMA, THE SUBROUTINE EXTENDING THE LANDING LEGS FAILED TO REPEAT, THE PROBE CRASHED AND MILLIONS OF DOLLARS WERE WASTED.
WHAT DO YOU THINK NOW?
I THINK I'M GOING TO BECOME A FLORIST!

```
1620 '
1630 '*** SAVE/LOAD ROUTINE ***
1640 '
1650 GOSUB 930: PRINT@64, "DATA
SAVE/RETRIEVE MENU...."
1660 PRINT@96,"1>LOAD FILE 2>SAV
E FILE  3>MENU";
1670 LS$ = INKEY$: IF LS$ = "" T
HEN 1670
1680 IF LS$ = "1" THEN 1750
1690 IF LS$ = "2" THEN 1890
1700 IF LS$ = "3" THEN GOTO 800
1710 GOTO 1650
1720 '
1730 '*** READ IN FILE ***
1740 '
1750 GOSUB 930:PRINT@64,"FILE LO
AD ROUTINE....":PRINT@96,"ENTER
FILE NAME";:INPUT NM$
1760 IF LEN(NM$) > 8 THEN NM$ =
LEFT$(NM$, 7)
1770 NM$ = NM$ + ".CNV"
1780 FOR CAND = 1 TO 6: CT(CAND)
 = 0: FOR PL = 1 TO 53: V(CAND,
PL) = 0: NEXT PL: NEXT CAND
1790 OPEN "I", 1, NM$
1800 INPUT #1, SVFLAG
1810 IF SVFLAG <> FLAG THEN CLOS
E 1: GOSUB 930:PRINT@96,"WRONG P
ARTY...LOAD ABORTED";:FOR DL=1 T
O 1200:NEXT DL:SOUND 150,1:GOTO
800
1820 FOR CAND = 1 TO 6: FOR PL =
 1 TO 53: INPUT #1, V(CAND, PL):
 CT(CAND) = CT(CAND) + V(CAND, P
L): NEXT PL: NEXT CAND
1830 CLOSE 1
1840 REM SS=224:FOR WP=1 TO 6:PR
INT@SS,STRING$(15," ");:SS=SS+32
:NEXT
1850 GOTO 800
1860 '
1870 '*** SAVE FILE ***
1880 '
1890 GOSUB 930:PRINT@64,"FILE SA
VE ROUTINE....":PRINT@96,"ENTER
FILE NAME";:INPUT NM$
1900 IF LEN(NM$) > 8 THEN NM$ =
LEFT$(NM$, 7)
1910 NM$ = NM$ + ".CNV"
1920 OPEN "O", 1, NM$
1930 SVFLAG = FLAG: WRITE #1, SV
FLAG
1940 FOR CAND=1TO6:FORPL=1TO53:W
RITE #1,V(CAND,PL):NEXTPL:NEXTCA
ND
1950 CLOSE 1
1960 GOTO 800
```

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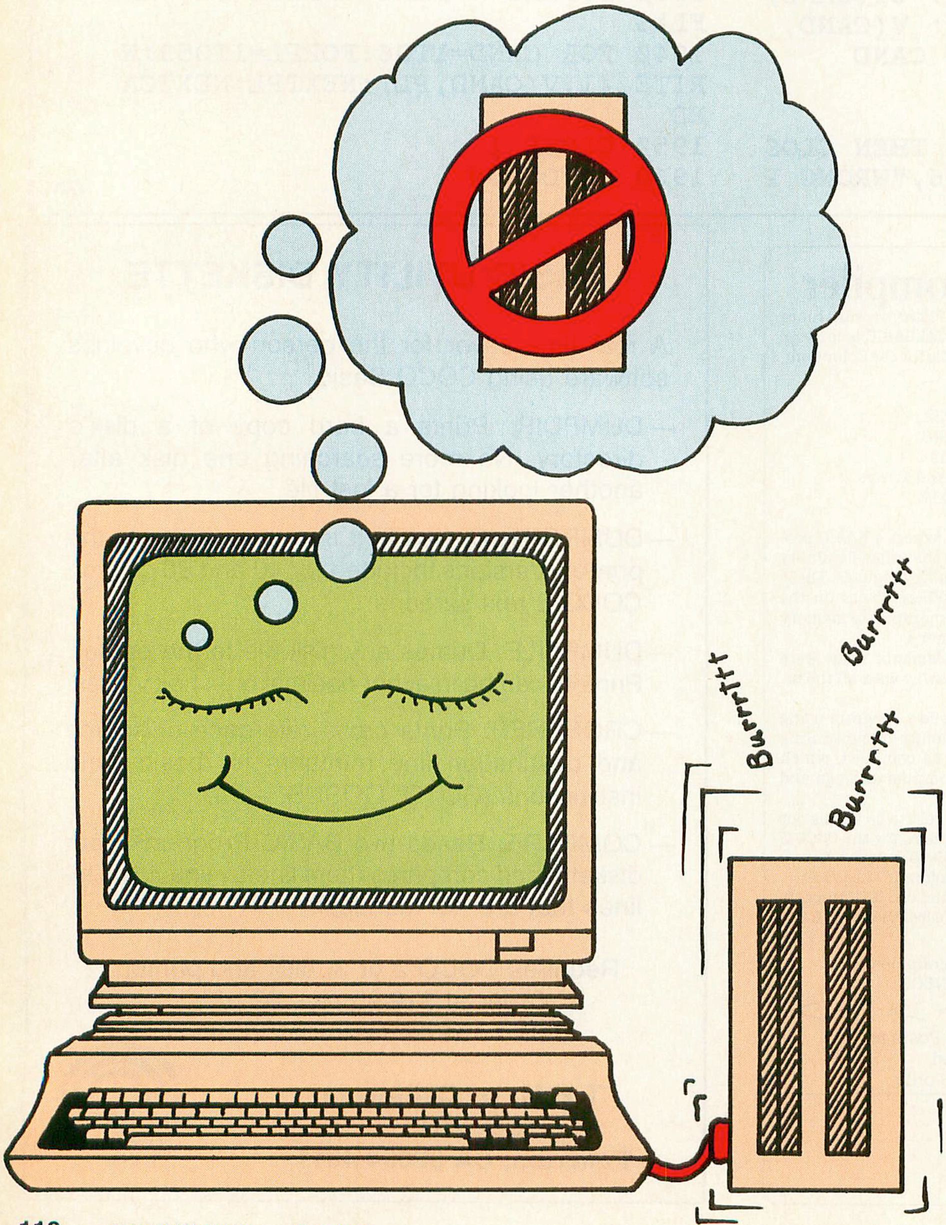
By Jeremy Spiller



Some of the finest programs cannot be run with a disk controller plugged in. Some are simply too long; others, written on systems without a drive, use memory locations normally reserved for disk-operation storage of binary subroutines or data. This means, of course, that the program must be loaded from cassette, a rather tedious process if you bought a disk drive in order to avoid all the little inconveniences of loading from tape. Well, fret no more! If you have a 64K CoCo you no longer have to unplug your disk drive controller in order to load and run these programs. They can be loaded from disk directly into memory and then run with the disk drive still in place. One note is in order here: because of the vectors used, this program will only work with CoCo 1 and 2. It will not work on a CoCo 3.

Using the Program

After keying in the program, be *very sure* to save it before you run it. *Disk-Off* kills itself after running.

Assume that the long program you want to run is stored on disk. Most of these programs are too long to actually run with the disk controller plugged in, but there is usually enough room in memory to at least store them. Therefore, before you run *DiskOff*, load your long program into the computer (you may need to `PCLEAR 1` first), and then store it on disk.

Now run *DiskOff*. At the prompt, type in the filename of your long program and press ENTER. The disk drive will turn on for one last time and load your long program into memory. When the cursor reappears, the computer has been fooled into thinking that disk BASIC does not exist. Type `RUN` and press ENTER; your program should run just as if the disk controller were not in place.

Jeremy Spiller is a high school junior who has been programming his CoCo for three years. He began using assembly language a year ago and learned the information needed for this program by disassembling parts of ROM.

How the Program Works

This program takes advantage of the fact that the computer allocates low memory for such things as graphics pages and disk buffer space at the time the computer is first turned on. The startup routine in ROM includes peeks in various locations to see what hardware is in place. If the disk controller card or a ROM pack is in the port, then locations &HC000 and &HC001 contain specific values. If the numbers in these locations are correct during the startup routine, the computer then assumes that a ROM pack or the disk drive controller is in place and executes the program contained in cartridge memory (&HC000 through &HFEFF). If the system is disk-based, then that program is Disk BASIC and includes reserving 2,048 bytes in low memory for use by the disk drive. These 2,048 bytes are located directly after the text screen memory and before the first graphics page reserved by Extended BASIC. It is the availability of these 2,048 bytes that makes it possible to run some programs only with the disk controller out of its slot. With no disk drive in place, the first graphics page starts directly after the text screen memory, leaving more room above the graphics pages for BASIC to operate and freeing up memory between &H600 and &HE00 for the user.

If, on the other hand, either of the first two bytes of the cartridge ROM is incorrect, the computer assumes there is no disk program to run; the startup routine goes on to initialize memory without making provisions for setting aside that critical 2,048 bytes in low memory. If it were somehow possible to load your BASIC program off disk into the correct position in memory, poke a zero into ROM Location &HC000 and then execute a cold start without losing your program, you could fool the computer into thinking that there was no drive controller in place. No space would be allocated to disk drive use, and more room would be made available to the user.

Unfortunately, it is impossible to poke anything into a ROM location other than what is already written there. On top of that, if you execute a cold start, you lose the BASIC program that you loaded off disk, right? Wrong!

If you have a 64K CoCo, you can in effect write into ROM. The trick is to copy ROM into high memory RAM and then revise it to your heart's content. The real problem comes when you try to run a cold start. Under normal circumstances, you may be operating in 64K mode with your revised software "ROM-twin", but as soon as you `POKE 113,0` and then press the reset button as you would to produce a cold start, something nasty happens. The reset routine automatically switches the machine out of 64K mode (and your modified software ROM-twin) back into 32K (and the computer's hardware ROM) instead. (If you try to execute `&HA027` with your software ROM-twin, your computer goes west and you'll have to power down to regain control.) A large part of *DiskOff* is devoted to overcoming this obstacle, as well as to restoring the BASIC program after the cold start is executed.

Program Nitty-Gritty

The data in lines 30, 50 and the last 11 bytes in Line 80 are three short machine language routines that are loaded into protected graphics memory in lines 40, 60 and 120. The first to be executed (Line 70) is the ever-popular program that transfers ROM into high-memory RAM two bytes at a time. After it accomplishes this task, it transfers control from the hardware ROM to its software twin in RAM before returning to *DiskOff*. Line 70 goes on to poke a zero into the first location in the ROM-twin. If a peek of that location returns a zero, then it is assumed that the transfer was successful and the original value is restored. If not, then it is assumed that you are still in hardware ROM, and that the computer is not equipped for 64K operation.

The next ML program stored in graphics memory is a routine that will restore the long BASIC program which will be loaded from disk just before the cold start. Bear in mind that while a cold start generally wipes out user access to BASIC programs previously stored in memory, the program itself remains largely intact provided the computer was not powered down. What *does* get destroyed are all references to the program in the lower 256 bytes of memory, namely memory locations 27 through 32 along with the first two bytes of the program itself. All of this information can be obtained by close inspection of the remains of the program after the cold start. RESTORE is designed to do this and to plug the correct values back into the correct memory locations.

Before covering the third ML routine poked into protected memory, we will look at the actual revisions that *DiskOff* makes in our software ROM-twin. (Please note that the only ML routine actually executed so far has been the one that copied ROM into RAM. None of the other code is executed until after the disk drive has loaded the program that ordinarily cannot be run with the drive in place.)

Line 90 pokes a short bit of code into our ROM-twin, preventing the microprocessor from poking zeros into the last page in ROM. While this is part of a normal cold start, poking anything into some of these locations would switch the computer back to the hardware ROM, a situation we want to prevent.

Line 100 similarly pokes code to divert the microprocessor around other ROM instructions that would prevent BASIC from working properly if executed.

Line 110 plugs in a patch that diverts the microprocessor to the RESTORE routine stored in protected memory. RESTORE is executed after the cold start. Line 110 pokes code replacing the normal jump to the cursor routine in ROM.

Line 130 pokes `113,0`, which flags for a cold start on a reset. It goes on to poke a zero in Location &HC000, tricking the computer into believing that there is nothing in the ROM port. Finally, it pokes `30` into Location 25, setting the start of BASIC to where it should be with no disk controller in place (2,048 bytes lower).

Lines 140 and 150 poke another message into the ROM locations that ordinarily code for the Microsoft copyright message appearing whenever you power up or run a cold start.

Now the fun begins. We have transferred ROM into high RAM, modified its cold start routine to protect its integrity during the cold start and to trick it into believing that there is nothing in the ROM pack port, and added patches that will automatically divert the microprocessor to the RESTORE routine in low memory. The machinery is in place, but it hasn't been activated yet; and Disk BASIC is still in operation. We are still free to load our non-disk program off the disk.

Line 170 is the key to the auto-execution of the cold start. Note the two pokes. BASIC keeps a jump vector stored in locations &H168 and &H169. Whenever you load a program off disk, Disk BASIC first fetches the disk directory entry and then prints a carriage return (`CHR$(13)`). It then loads the program (remember that Line 130 causes it to load 2,048 bytes lower than normal) and finally prints an "OK." Before each screen print, Disk BASIC looks at locations &H168 and &H169 to determine where its next set of instructions lie.

Disk Off changes the jump vector held in these locations and, in so doing, diverts the microprocessor to the COLD START TRIGGER, the third routine loaded by Line 120 into low memory. This program checks to see if the character to be printed is the carriage return. If it is, it sends the microprocessor back to load the program into memory. If the character is the "O" (in "OK"), then the program is assumed to be loaded; TRIGGER turns off the disk drive motor by poking a zero into &HFF40, then diverts the microprocessor to our modified cold start by calling a jump to &HA027.

Now all the machinery that we put into place earlier is activated. Extended BASIC checks to see if there is anything in the cartridge slot. (Our zero in Location &HC000 tricks it into believing that there is not.) It then initializes RAM, jumping around the areas that would damage our ROM-twin. When it is finished, it is diverted to the RESTORE program, which scans the remains of our BASIC program to replace the missing information in low memory. Finally, RESTORE returns control to BASIC by jumping to &HA0E2 (the cursor), and *voila*!

We are now back in Extended BASIC, with the program loaded into memory. At this point Disk BASIC is totally disabled, and any disk commands return a syntax error. Type `RUN` and play the game without having to remove the disk drive controller.

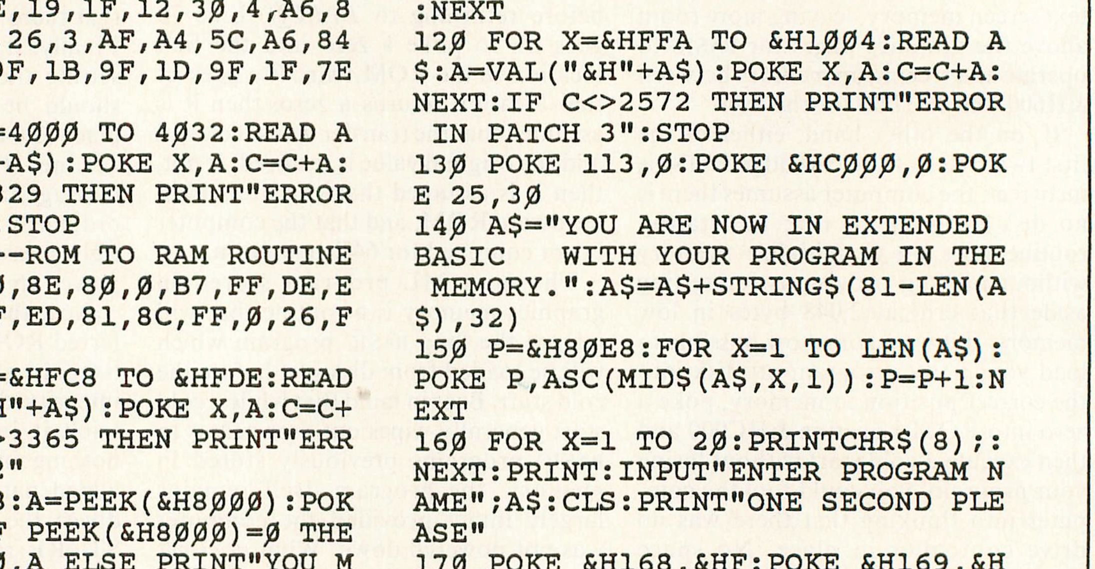
(Questions or comments concerning this program may be directed to the author at RFD 1, P.O. Box 1094, Townsend, MA 01469. Please enclose an SASE when requesting a reply.) ☐

The listing: DISKOFF

```
1 '******************************
3 '*          DISKOFF           *
5 '*    BY JEREMY SPILLER       *
7 '*           1985             *
9 '******************************
10 CLS:PRINT"THIS PROGRAM WILL A
LLOW YOU TO  LOAD AND RUN PROGRA
MS OFF YOUR  DISK DRIVE WHICH NO
RMALLY CANNOTBE RUN WITH THE DIS
K CONTROLLER PLUGGED IN."
20 PRINT@172,"thinking"
25 'PATCH 1---RESTORE ROUTINE
30 DATA 5F,9E,19,1F,12,30,4,A6,8
0,26,FC,C1,0,26,3,AF,A4,5C,A6,84
,26,EF,30,2,9F,1B,9F,1D,9F,1F,7E
,A0,E2
40 C=0:FOR X=4000 TO 4032:READ A
$:A=VAL("&H"+A$):POKE X,A:C=C+A:
NEXT:IF C<>3329 THEN PRINT"ERROR
 IN PATCH 1":STOP
45 'PATCH 2---ROM TO RAM ROUTINE
50 DATA 1A,50,8E,80,0,B7,FF,DE,E
C,84,B7,FF,DF,ED,81,8C,FF,0,26,F
1,1C,AF,39
60 C=0:FOR X=&HFC8 TO &HFDE:READ
 A$:A=VAL("&H"+A$):POKE X,A:C=C+
A:NEXT:IF C<>3365 THEN PRINT"ERR
OR IN PATCH 2"
70 EXEC &HFC8:A=PEEK(&H8000):POK
E &H8000,0:IF PEEK(&H8000)=0 THE
N POKE &H8000,A ELSE PRINT"YOU M
UST HAVE 64K":STOP
75 'PATCH 3--ROM PATCHES & COLD
START TRIGGER
80 DATA E0,5F,7E,A0,5B,8E,7F,FF,
20,A,7E,F,A0,81,D,26,1,39,7F,FF,
40,7E,A0,27
90 C=0:FOR X=&HA053 TO &HA057:RE
AD A$:A=VAL("&H"+A$):POKE X,A:C=
C+A:NEXT
100 FOR X=&HA084 TO &HA088:READ
A$:A=VAL("&H"+A$):POKE X,A:C=C+A
:NEXT
110 FOR X=&H80BD TO &H80BF:READ
A$:A=VAL("&H"+A$):POKE X,A:C=C+A
:NEXT
120 FOR X=&HFFA TO &H1004:READ A
$:A=VAL("&H"+A$):POKE X,A:C=C+A:
NEXT:IF C<>2572 THEN PRINT"ERROR
 IN PATCH 3":STOP
130 POKE 113,0:POKE &HC000,0:POK
E 25,30
140 A$="YOU ARE NOW IN EXTENDED
BASIC   WITH YOUR PROGRAM IN THE
 MEMORY.":A$=A$+STRING$(81-LEN(A
$),32)
150 P=&H80E8:FOR X=1 TO LEN(A$):
POKE P,ASC(MID$(A$,X,1)):P=P+1:N
EXT
160 FOR X=1 TO 20:PRINTCHR$(8);:
NEXT:PRINT:INPUT"ENTER PROGRAM N
AME";A$:CLS:PRINT"ONE SECOND PLE
ASE"
170 POKE &H168,&HF:POKE &H169,&H
FA:LOAD A$
```

Dr. Nibble

By Kelly Taylor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Includes detailed audit trails and history reports for each customer, perpares invoices and monthly statements, mailing labels, aging lists, and an alphabetized customer listing. The user can define net terms for commercial accounts or finance charges for revolving accounts. This package functions as a standalone A/R system or integrates with the Small Business Accting package.

$59.95

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Designed for the maintenance of vendor and A/P invoice files. The system prints checks, voids checks, cancels checks, deletes cancelled checks, and deletes paid A/P invoices. The user can run a Vendor List, Vendor Status report, Vendor Aged report, and an A/P Check Register. This package can be used either as a standalone A/P system or can be integrated with the Small Business Accounting Package.

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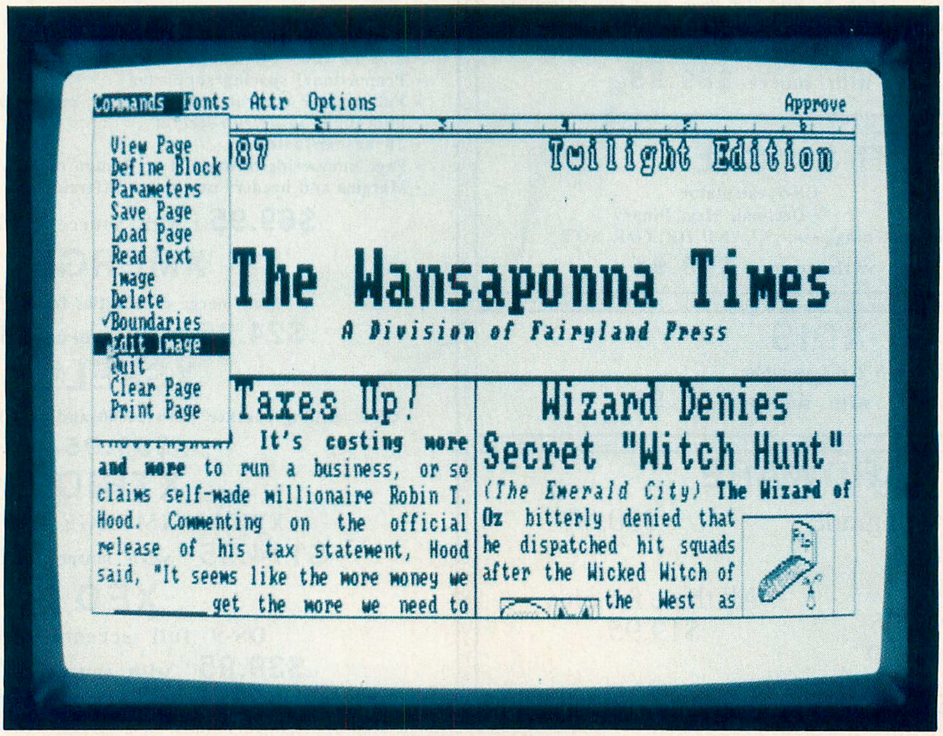


87 Twilight Edition

The Wansaponna Times

A Division of Fairyland Press

Taxes Up!

It's costing more and more to run a business, or so claims self-made millionaire Robin T. Hood. Commenting on the official release of his tax statement, Hood said, "It seems like the more money we get the more we need to

Wizard Denies Secret "Witch Hunt"

(The Emerald City) The Wizard of Oz bitterly denied that he dispatched hit squads after the Wicked Witch of the West as

Software CoCo 3

Home Publisher — Getting the Word out on the CoCo 3

Tandy's *Home Publisher* is a desktop publishing program written especially for your CoCo 3. By combining detailed graphics and different sizes and styles of text on one page, you can produce high-quality newsletters, announcements, or any other type of small document using your computer and printer.

Written in OS-9 Level II (but you don't need OS-9 Level II to run it), the program requires at least one disk drive. A joystick or mouse would be a worthwhile addition, but is not required to run the program successfully. The disk is not copy-protected, so it's easy to make a backup for your own protection. You can also install the program on a hard disk.

The program loads with some rather complex instructions, having you type a few OS-9 commands, but the screen tells exactly what to do:

```
CHX /D0/CMDS ENTER
CHD /D0 ENTER
EX PUBLISH >/TERM </TERM
>>/TERM ENTER
```

512K users have a shortcut in that they can type `EX PUBLISH` as the last instruction, but 128K users must type the whole line each time they boot up. In my opinion, a program of this caliber should be easier to access, having a configure program to create a boot file. More advanced programmers will likely develop their own boot files to prevent this extra typing.

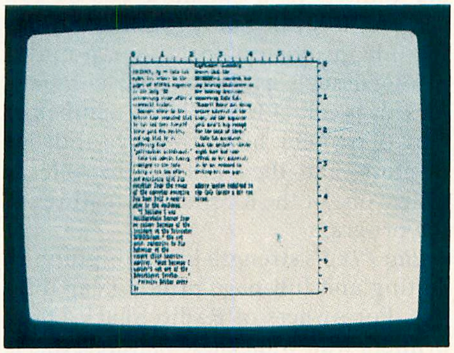
If your disk controller is equipped with DOS 2.0 or earlier, you will not be able to start the program with the `DOS` command. However, the instruction book provides a short BASIC loader program that will boot the program.

Once the program has been loaded, you will see the high resolution work screen headed by a command line at the top. Here are some of the commands available: View Page; Define Block, which determines how your composition will be laid out; Parameters, which sets block and margin locations, font sizes, spacing and justification; Save/Load Page; Read Text, allowing you to read in standard ASCII text files; Image, which provides 37 drawings that can be incorporated into your work; Delete; Boundaries; Edit Image; Quit; Clear Page; and Print Page.

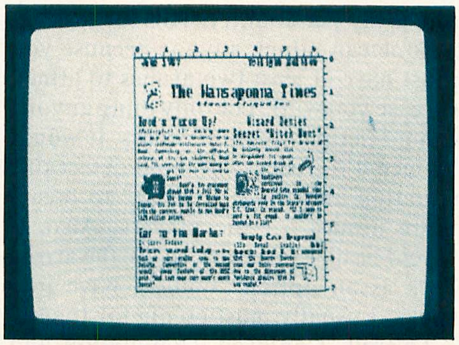
The Fonts command yields a directory of 14 fonts; the ATTR command changes font styles (you can select from bold, outline, italics or shadowed letters). Under the Options command you define or change your system configuration for the following: printer double-strike mode, Hi-Res Joystick, RGB or composite monitor, foreground and background colors, system setup (initial block format in either one, two or three columns), default drives and directory, justification and printer (Tandy DMP or Epson RX-80).

Only half of the page is visible on-screen even though the entire page is kept in memory. To see the other half, you must position the cursor to the extreme left of the workspace screen and press the joystick or mouse button. It is possible to see the entire page at any time through a previewing feature, but the page will not be completely readable. Previewing is useful because it allows you to see how your page looks before you commit to printing.

The use of multiple pop-up windows and menus makes *Home Publisher* very user-friendly. After about 30 minutes of computer use, I was able to create some pretty neat-looking newsletters. I do recommend the use of the Tandy Hi-Res Joystick Interface; it makes cursor operation smoother and is a must if you intend to edit any of the graphic images supplied on the disk. Although the 45-page instruction manual is well-written and easy to follow, most users will catch on quickly and not need the book other than for minor referencing.



I was disappointed that the program does not contain printer drivers for many of the other popular printers on the market, such as Star, Okidata and other models of Epson. I guess Tandy thinks that just because we own CoCo 3s, we must also own its DMP printers. My other complaint, as stated at the beginning of this review, is the complex way in which the program has to be loaded.



But, all in all, *Home Publisher* does what it is advertised to do, and it does it well. The price is reasonable and the results are gratifying.

(Tandy Corporation, 1700 One Tandy Center, Fort Worth, TX 76102; $39.95: Available in Radio Shack stores nationwide.)

— Robert Gray

Software CoCo 1, 2 & 3

Cartoonamator — A Moving Experience

Patience isn't one of my numerous virtues — neither is programming graphics. The thought of typing in 1,373 `DRAW` statements appeals to me at about the same level that gum surgery does.

Cartoonamator, however, allows me to exercise my previously well-hidden talent for animation without the accompanying frustration. The creators obviously knew that human beings would be using it; one piece of practical advice in the excellent instructions reads: "If you mess up, just press BREAK and rerun the program. Your animation will not be lost, and your previous cell will remain unaffected." How about that?

The instructions complement the screen menus perfectly. Even people like me have a hard time making mistakes.

The basis for the whole operation is the "cell," a rectangular area in which you can put nine different colored blocks. By combining cells into a sequence of frames (which includes the capability to load more than one cell into a frame), you create animation. The results are a bit blocky, since you are using blocks, but so what? Let the Disney Studios take care of the involved stuff. You just have to realize that curves aren't really possible, so make designs that don't involve them.

Hint: Take notes on which cell is which — even though you can review them — so you don't get sudden changes you hadn't planned on. The same applies to the backgrounds, which you design separately. You combine the two in the frames.

You can also store favorite backgrounds and cells on the disk for later use in other animation projects. Obviously, you can store a complete animation sequence also — thus you could build part of it, store it, add some things later after a reload and keep building. The program advises you of how much memory you have remaining.

Operating under the theory that you just might make a mistake now and then, the program is loaded with prompts to help you escape before you insert something you'll regret later. When you put more than one cell in a frame, each one is displayed so you can check spacing. In addition, you can edit individual cells; once done, the changes you made automatically overlay that cell number wherever it shows up in the sequence.

It takes a while to use the joystick properly for cell placement. The instructions are clear enough; the reactions (mine) take a little more work.

The Display menu allows you to review the entire animation set you created step-by-step, in slow motion, or in regular motion or high speed. If you select high-speed, the program asks what type of CoCo you have, 1, 2 or 3.

Other than the animation you'll start producing within half an hour after making your backup copy, *Cartoonamator* is just fun to play around with. You can start with simple animation and work your way up to darkening skies and stellar explosions. A heck of a product for the price. Warning: It can be addicting.

(CoCotronics Software, 51 Briarwood, Irvine, CA 92714, 714-651-0283; $14.95 plus $1.50 S/H)

— John M. Hebert

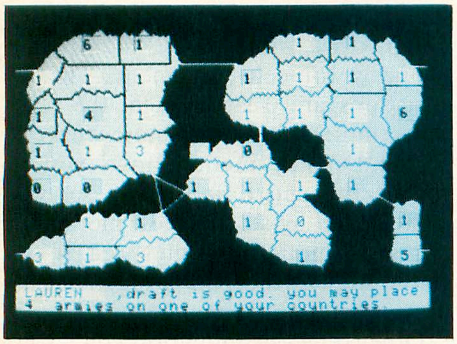
Software CoCo 3

Domination — Surround the World in 80 Plays

HAWKSoft's *Domination* is a "Risk" board-type game that two to six players can play on the CoCo 3. The object of the game is to dominate the planet by using armies to defeat those of another player.

When the game starts, it randomly divides the world among the players. Then it goes through a series of rounds that allow the players to place their remaining armies, five at a time, on their countries. Each player must concentrate armies where they will provide the best offensive and defensive position. A lot of strategy is required with *Domination*, because you cannot randomly place your armies just anywhere.

When a player decides to attack another, he needs to take into account how many armies he can deploy for offense and how many the opponent can use for defense. At each turn a player may attack, move armies or pass to the next player. There is also the option of stopping the game and saving the board to continue later.



```
LAUREN    ,draft is good. you may place
4 armies on one of your countries.
```

If a player decides to attack, he must pick which of his countries he will attack from, who to attack and how many armies to attack with. Then the defending player gets the chance to pick the number of armies he wishes to defend with. After the battle is decided, the defeated army is reduced. If the attacking army has defeated all the available armies of his opponent, he takes control of the country and transfers one of his armies to his new country. The process of attack and defense goes on until one player has domination over the entire planet, or everyone decides to quit.

Domination is an entertaining game worth its price tag, but I have a "wish list" of features I think would make it even better. When playing with young players, I noticed they usually attack so often that everyone ends up with only one army per country. This means that no one can attack anyone because you must have at least two armies to attack (in case you win). The only thing anyone can do in this situation is pass. It would be nice if the program could detect this situation and force a "draft" to create more armies for the players. Also, it would be nice to be able to use the arrow keys as an option. While I have joysticks, I usually must go dig for them.

Overall, I enjoyed *Domination* and was very happy to see an entertaining game below the $20 barrier. I must warn people, though, that this is not a game you can play in a few minutes. I have been involved in games of Risk that have gone on for days.

(HAWKSoft, P.O. Box #7112, Elgin, IL 60121, 312-742-3084; $18)

— Dale Shell

Software CoCo 1, 2 & 3

Big Pix 3 — Seeing the Big Picture

Have you ever wanted a graphics program that would fill an 8½-by-11 inch page? Well, *Big Pix 3* can both draw and print pictures up to 456 by 565 pixels — this is about six times the overall size of the normal `PMODE 4` graphics screen.

Two joysticks and 64K are required to operate the program. The right joystick controls cursor movement. When you move the joystick, the cursor creeps across the screen, pixel by pixel. Holding down the firebutton makes the cursor move even faster. The left joystick controls the window or workspace. Even though one Hi-Res screen is displayed at a time, there is plenty of extra space left to the sides, top and bottom of the displayed screen.

Big Pix includes most of the standard drawing commands, such as Circle, Box, Line, Draw, Erase, Paint, Ray and others. In addition, Get, Put and Invert are available for manipulation of pictures. Zoom provides a greatly magnified view of sections of the screen. Also, 10 different fonts are available for writing text to the screen.

In some ways, *Big Pix 3* is much like many of the drawing programs currently on the market, less the icons and pull-down menus. Its features are accessed by pressing one or more keys. One feature, Move Cursor, actually lets you enter the *x* and *y* coordinates manually for more precise cursor movement.

Files from other CoCo graphics programs such as *CoCo Max* and *Graphicom* can be loaded and edited. I tried several picture files from *CoCo Max II* and found that they loaded without problem. If you have *Graphicom Part 2*, you can use the *Big Pix* font editor to change *Graphicom 2* fonts into *Big Pix* fonts. This same font editor will also allow you to create and save custom fonts.

Program documentation is complete and well-written. Included on the program disk is a printable documentation file, just in case you misplace the original instructions.

On the down side, I found that using joysticks to manipulate the graphics gets to be somewhat tedious. Screen movement can be jerky in the Zoom function, because of the limits of the standard joystick ports. A routine to incorporate the Hi-Res joystick adapter would be a blessing.

The printer dump for both large and small picture sizes is set up for Radio Shack dot matrix printers only. Owners of other brands of printers need to provide their own printer dumps, and are limited to a standard 256-by-192 screen. I think the program should include provision for other popular printers, such as Epson and compatibles. It is a fact that a large number of CoCo owners have these brands of printers, and they will not be able to utilize one of the most useful features of the program.

Big Pix 3's strength lies in its graphics editing and full-page printing capabilities. For owners of Radio Shack DMP printers who want these features, this is an excellent product.

(Tothian Software, Inc., Box 663, Rimersburg, PA 16248; $24.95)

— Mark Haverstock

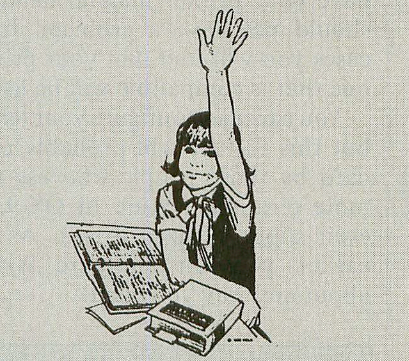
Computer Island Educational Software

BEYOND WORDS

32K Ext. - $19.95 tape/$24.95 disk

These Language Arts programs cover common misspellings, and synonyns/antonyms on each level. Additionally, Level 1 tests contractions and abbreviations, Level 2 tests homonyms, and Level 3 tests analogies. Each program has three parts and contains over 400 questions and uses over 800 words. All tests are grade appropriate. User modifiable (directions included). Printer option. Specify Level.

Level 1	Grades 3-5
Level 2	Grades 6-8
Level 3	Grades 9-12



VOCABULARY BUILDER

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200 Vocabulary questions on appropriate grade levels in a 4 part multiple choice format. 1000 words used. Extensive research has provided challenging words on all levels. When mastered, the words may be changed by the user (full directions included). Printer option. Specify Level.

Level 1	Grades 3-5
Level 2	Grades 6-8
Level 3	Grades 9-12

CONTEXT CLUES - 4, 5, 6, 7

16K Ext. - $17.95 tape/$22.95 disk

Each reading program contains about 50 situational paragraphs with one key word missing. Child uses context clues to find correct answer in multiple choice format. Random selection of readings each round. Specify 4th, 5th, 6th, or 7th grade.

CONTEXT CLUES - 2-3

32K Ext. - $19.95 tape/$24.95 disk

A reading program wherein the child uses the context to choose the correct answer. Multiple choice format. Hi-res screen. Grades 2-3.

TRIGONOMETRY TUTOR

32K Ext. - $19.95 tape/$24.95 disk

A step by step tutorial for learning to compute the sides and angles of right triangles. All examples have graphic representation. Help commands and cursor aids assist throughout.

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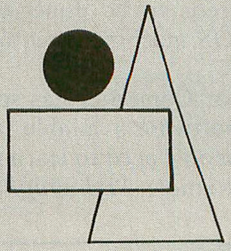

AREA & PERIMETER

32K Ext. - $19.95 tape/$24.95 disk

Triangles, rectangles, and circles and covered in this Hi-res text and graphic program.

COCO WHEEL OF FORTUNE

32K Ext. - $19.95 tape/$24.95 disk

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Stylograph — Power User's Word Processing Package

Our little Color Computer has grown a lot since its introduction as a 4K RAM machine, but many people still seem to think of it as a game machine. When serious work needs to be done, they think an MS-DOS machine is required to do the job.

Well, the Color Computer has some very powerful software available, and computer salespeople need to learn this fact. Take, for example, *Stylograph*, an OS-9 Level II word processing system. I would put this program up against just about anything in the MS-DOS world that is within three times its price range. And this is for a game machine? Gimme a break!

Stylograph III uses the power of OS-9 Level II to advance our Color Computer even closer to the no-longer-better-but-more-expensive machines. The *Stylograph III* package comes with the *Stylograph* word processing system, the *Stylograph III* Mail Merge and the *Stylograph II* Spelling Checker. Included is a comprehensive manual with a three-lesson tutorial. As an upgrade from the OS-9 Level I version, *Stylograph* is very versatile — this flexibility means there are a lot of features to learn, so I highly recommend going through the tutorial at least once. After you become familiar with *Stylo*, you can easily do just about anything you want.

There are a few small differences between the standard OS-9 version and the new version. The two I think most important are the different keystroke combinations used for the tab function and the escape sequence. I did not find a reference to the delete key, but I am sure it is in the manual somewhere. But these differences will give you very little heartache when compared to the power and versatility you will gain.

Just like earlier incarnations of *Stylo*, the new OS-9 Level II version can be configured to just about any hardware setup you can think of. It already has a large list of supported printers; if you do not find yours or a compatible listed, you can modify the drivers for your printer. This is not hard. The program takes you through a menu and asks questions about your printer; if you have your printer manual handy, you should not have a problem. In most cases you will find that your printer or one that is compatible will be listed.

You can also configure your terminal, but this feature will probably only be used by those people who use the remote terminal feature of OS-9. *Stylo* even supports hard drives. As I said earlier, you can configure *Stylo* just about any way you want.

> ***"I think* Stylograph *has taken the CoCo, under OS-9 Level II, another giant step forward."***

Stylo uses three main modes. The Supervisor mode is well-named. It does not do much of the real work, but you go from there to the other menus where the real work is done. The Supervisor menu allows you to choose the options of editing, printing, saving, loading, appending, erasing or spooling a file to another file to be printed later.

The Insert mode is used to enter the text. This mode actually contains three modes: Insert, Overwrite and Programmers. The first two should be fairly clear by their names. The Programmers mode is new, but not to old users of *Stylo*. It can be invoked from either the

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Insert or Overwrite mode and is similar to those two except that it adds a feature to aid people who do programming. Using the tab stops, the cursor will return to the last tab used after each return (sort of resetting the left margin temporarily). This helps if you indent a section of your file.

The third mode is the Escape mode, for cursor control. It allows you to move around the screen and to scroll the screen. It is also used for finding, replacing, moving, erasing or duplicating text strings. This is where block manipulations are done.

Stylo is also extremely comprehensive in its ability to format text. It includes all the things a printer can do to text, i.e., make it bold, enhanced, expanded, underlined, overlined, etc. But, for me, *Stylo*'s best feature is its dynamic formatting. As soon as you enter a format code, you see the effects on the screen. Centering, left and right justification and even underlining is shown right on the screen. Footers and headers are shown on each page along with the page breaks. These along with the status line let you know just where you are on a page — and you will know exactly how the output will look. The status line tells you the column, line and page number of the cursor.

Now, *Stylo* cannot duplicate all the special effects on the screen that your printer can on paper (like boldface and overlines), but a view command is available that shows all the words that have special effects on them, and the effects are coded so that you will know at a glance exactly what they are. *Stylo* even includes a math package to allow manipulating numbers in the text, both by row and by column. There are many other features too numerous to mention.

Stylo has finally brought all the features of a professional "big computer" word processor to the Color Computer. You will have to see it to fully appreciate all the features. But as always, I would like to see an addition. The current modes are displayed above the status line, all but for the Programmers mode; I would like to see this included. Also, *Stylo* comes with a template of the keyboard to illustrate the special keys. The template I received was for the CoCo 2, which has a keyboard layout different from that of the CoCo 3. The company is, however, working on a new template.

My final criticism concerns the spelling checker; it does not correct misspelled words for you. It will flag the word, but you still have to look up the spelling yourself. When I misspell something, I want a program to tell me how to fix it, or at least make a suggestion. I have this complaint with most spell checkers. To be fair, I must add that while the spelling checker does not do all I would like it to, it does what it *does* do very fast.

Overall, I think *Stylograph* has taken the CoCo, under OS-9 Level II, another giant step forward. And while it works with 128K, it really needs 512K to soar like an eagle. I highly recommend *Stylograph* to anyone who does serious word processing or wants to take advantage of all the features the CoCo 3 has to offer. Now, if we could just convince "some people" to take the Color Computer seriously, showing them it is not a game machine but the most powerful eight-bit computer money can buy, well, we could really fly.

(Stylo Software, Inc., P.O. Box 916, Idaho Falls, ID 83402, 208-529-3210; *$199.95*)

— Dale Shell

Software CoCo 1, 2 & 3

EZWriter — User-Friendly Letter Writer

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one of those people who, like me, just can't seem to get around to writing letters, no matter how good you feel when you actually drop that envelope into the mailbox? If so, *EZWriter*, available on tape or disk from E.Z. Friendly Software, may be of interest to you.

EZWriter enables you to compose a short (one page maximum) letter, save it to disk or tape and print out one or more copies, without the struggle of learning a full-featured word processor. It also provides the capability of storing a mailing list, which can be used to print mailing labels.

A separate copy of your letter can be printed for each person on the mailing list, complete with personalized address and salutation on each. This is an extremely nice feature and would have immediate value to small businessmen, club secretaries, and people who send out those "state of the household" letters in their Christmas cards! Once a letter or mailing list is stored, it can be retrieved and updated as necessary.

EZWriter is intended to be simple to use and attractive to people who do not care to invest the necessary hours to learn word processing. In that intent it succeeds admirably. I was able to begin typing a letter within minutes of opening the package, with only the barest glance at the documentation, which is clear and readable. The screen displays are largely self-evident, and there are no confusing inconsistencies. If you find word processing intimidating, you'll love *EZWriter*!

On the other side of the commentary, however, the program is written entirely in BASIC, and is therefore quite slow. I am not a great typist, but *EZWriter* was consistently unable to keep up with me. Another irritant involves mailing labels. There is no provision for checking alignment of the label paper before printing commences, nor can you suspend printing in the case of a printer jam.

Some of my complaints about this package are a matter of design tradeoffs: Should the program be easy, or more flexible? In each case, the author went for ease of use. The text you enter can only be edited by replacing individual lines with new ones, and the new lines must be very nearly the same length as the old ones. You have no choice as to the wording of the salutation ("Dear") or the closing ("Sincerely"), nor do you have control over such things as page size, line length, margins, etc. The author's stated goal is one of relieving the user of having to deal with technical clutter.

I found one error in the program. Prior to printing a letter, it asks if you want to change the printer baud rate. If you do, and respond with `2400`, as in my case, the program does *not* reset the baud rate. Instead it returns to "Do you want to change the baud rate?" It continues to ask this until you respond with `Y` and give it a value other than 2400.

You can fix this error by replacing lines 765 and 766 with a line in which you simply do a `POKE(150,`*xx*`)`, where *xx* is the appropriate value for your baud rate. If you don't care to mess with the program, you should set your baud rate before running the program, then answer `N` when asked if you want to reset it.

EZWriter is a great program for someone who wants the minimum necessary to write and print a single-page letter.

(E.Z. Friendly Software, Hutton & Orchard Streets, Rhinecliff, NY 12574, 914-876-3935; $19.95 plus $1.50 S/H)

— Jim K. Issel

Book

Computer Dictionary — From A Bus to Zone, Plus

Shortly after I joined the editorial staff of RAINBOW, I was given the task of compiling an in-house dictionary/stylebook to help the editors deal consistently with "Computerese." I prepared a formidable list of the terms, abbreviations and acronyms we regularly encounter, then began to search for standard spellings and definitions. The effort was only partly successful, however, because I soon discovered that computer vocabulary is a vast conglomeration of specialized terminologies and a sort of high-tech patois that seems to change, along with the technology, by the nanosecond.

Fortunately, I was relieved of my duties as company lexicographer when we acquired the fourth edition of Charles Sippl's *Computer Dictionary*, which has become an indispensable resource for all of us here at THE RAINBOW. Although we use it professionally in a variety of situations (from verifying spelling to clarifying terms and concepts), this would be a valuable reference book for anyone who spends any time at all around computers. It is easy to use and covers an impressive number of subjects in a thorough, straightforward way.

As in a normal dictionary, the entries in *Computer Dictionary* are alphabetized (abbreviations are alphabetized right along with the words rather than grouped together at the beginning), and the first and last entry on each page appear as headings to let you know what you will find on that page. There are also numerous cross-references to simplify your search for items that could have more than one location — for example, the entry "primitives" says "See graphics primitives." This is an important timesaver, because there are so many computer terms that mean essentially the same thing but are referred to in different ways.

Since this is a dictionary, the information you need is quickly accessible and presented in manageable proportions — but it is by no means limited to minimal definitions. *Computer Dictionary* is billed as a "browsing dictionary"; the entries contain enough detail, description, historical background, and even diagrams and photographs to provide a clear explanation of each subject.

Computer Dictionary contains more than 12,000 entries dealing with micro-, mini- and mainframe computer technology. The entries range from elementary (bit, disk, garbage) to esoteric (econometrics, silicon compilation, zatacode indexing) and cover a wide selection of computer-related topics.

The publishers are apparently committed to keeping this book as current as possible, too, revising it as the computer industry grows and changes. This edition has been updated and contains over 1,000 new entries, with an emphasis on robotics, artificial intelligence and factory automation. In his preface, the author suggests 20 areas of technological advancement that may bear watching in the future. They include developments in such areas as office automation, operating systems, voice recognition and synthesis, and computer-controlled video systems — developments that will presumably be included in future editions of *Computer Dictionary*. Such concern with the evolution of computer technology is a measure of the reliability and usefulness of this book.

These days, the volume and complexity of computer-related subjects can be intimidating and confusing. But, to borrow from an old adage, you don't need to know everything, as long as you know where to look it up. And that's easy — just reach for your *Computer Dictionary.*

(Howard W. Sams & Co., Inc., 4300 West 62nd St., Indianapolis, IN 46268, 800-428-3602; $24.95)

— Jody Gilbert

Software CoCo 3

System5 — CoCo 3 Graphics Package

System5 is a Hi-Res graphics generator written for your 512K CoCo 3, requiring at least one disk drive, a monitor and Radio Shack's Hi-Res Interface (Cat. No. #26-3028).

You can use the program with a joystick or touch pad, but a mouse is recommended. The disk is not copy-protected, so you can make a backup copy for safekeeping. Although I did not try the program on a color composite monitor, the 20-page instruction booklet explains how to merge a composite routine available on the disk.

The program boots with a simple `RUN "SYSTEM5"`, but loading takes about 30 seconds. The main program is written in machine language — once it's loaded, the program is fast and smooth.

The main menu presents 20 icons ready for action. You use your mouse or joystick to point to the desired icon, and then press the button to select it.

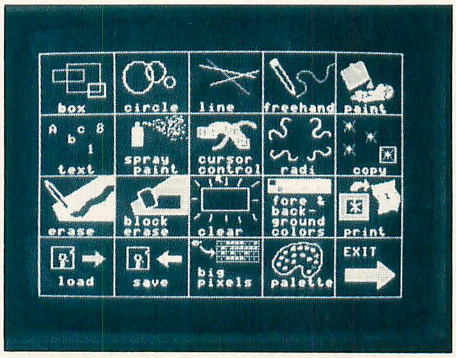
The drawing icons include Box, Circle, Line and Freehand. You can make any size rectangle or circle you want. Line lets you draw lines using the "rubber band" method, while Freehand allows you to draw at will. There are five cursor sizes in cursor control mode, comparable to the range from a fine-tipped pen to a piece of chalk.

You can choose foreground and background colors and fill in your drawings by choosing the Paint icon, and with Text you can add words to your artwork. Spray Paint is a little like doing graffiti — you actually "spray" color on the screen. Another interesting effect is Radi, which makes four mirror-image freehand patterns on the *x* and *y* axes. You have to see this function to appreciate it.

Editing icons include Palette, Big Pixels, Copy, Erase, Block Erase and Clear. Palette lets you use all of CoCo 3's 64 available colors in your pictures. The settings are saved and loaded with your pictures automatically. Big Pixels enlarges an area of the screen for precise editing; this helps you achieve detail. With Copy you can duplicate an entire image or part of an image on another part of the screen. Erase and Block Erase let you wipe away a little or a lot of your work. If you're really unhappy with your drawing, you can use Clear to wipe the whole screen and start again.

The other icon options are Print, Load, Save and Exit, which are self-explanatory. The programmer blessed the Exit function with an "Are you sure?" feature, which might save a careless CoCoist hours of work.

At any time during your drawing exercises you can press the F1 key. This results in a drop-down menu that has the options of Undo, All Undo, Insure and Redraw. Undo lets you erase or delete your last activity. If you don't like the size of the last square you drew, just Undo it. You can even erase a series of activities.



Insure/Redraw is a novel feature. With these two commands you can save an image temporarily in memory and then recall it. This is useful if you are not quite satisfied with your work and keep modifying it only to realize later that you should have left it alone in the first place! When you have reached a turning point in your drawing and are unsure about how to proceed, select Insure and try out some different ways. If you don't like the changes, just select Redraw and your original picture will appear. Although you can do the same

Reviewer Information

In order to continue to bring Tandy Color Computer users all the best information about new hardware and software products each month, we are expanding our independent review staff. Therefore, we invite you to join THE RAINBOW's elite fleet of reviewers.

You read THE RAINBOW because you love your Tandy Color Computer, so if you want a creative outlet and a chance to examine quality hardware and software, with your observations published nationwide, we want to hear from you.

Send us a cover letter with your name, address, occupation, list of equipment, areas of general interests, and a sample review of a CoCo product you are currently using. We look forward to your response. After all, we already see you have the best taste in computers.

Reply to:

Reviews Editor
THE RAINBOW
The Falsoft Building
P.O. Box 385
Prospect, KY 40059

thing with disk saves, this approach is faster and provides easier editing.

The author states in the manual that *System5* was not intended to print out pictures, but he has included two print routines in the program for the DMP-105, DMP-106 and DMP-130 printers. I have a Star printer, so I was unable to try the print function.

System5 supports up to four disk drives, and I can see why. Each picture takes up 14 granules on the disk! The picture files are saved with a `.PIC` extension. A demo picture is included on the system disk.

I am impressed with *System5*. My first thought upon opening the package was that it was just another graphics package, but it is really fun and very easy to use. The command icons are simple and straightforward. I was unable to detect any serious flaws in the program, and it performed as advertised. Although it does not offer some of the more advanced options available from the big guys, this neat package is well worth your consideration.

(Sun Products, 5455 Hansel Ave., Building L, Suite 7, Edgewood, FL 32809, 804-451-1255; $12.95: First product review for this company appearing in THE RAINBOW.)

— Jerry Semones

Software CoCo 1, 2 & 3

Hyper-I/O — Configure Your Drive System

If you have been considering a 3½-inch drive or hard drive for your CoCo, *Hyper-I/O* from Burke & Burke may be what you are looking for, especially if you don't want to move to OS-9. *Hyper-I/O* is a dynamic disk interface that allows you to use almost any type of floppy or hard disk drive in any combination on a CoCo 1, 2 or 3. It can also coexist on a hard drive with OS-9 if you change your mind and want to use OS-9 at a later time.

Hyper-I/O comes on an unprotected disk and has an 80-page manual that fully explains all of the many functions. Other features include full user-configurability, the ability to put *Hyper-I/O* on EPROM, enhanced BASIC commands for access to new features, and the ability to read standard disks in quad-density drives.

The program is compatible with the Burke & Burke CoCo XT and CoCo XT-RTC hard disk (reviewed April 1988, Page 137) and competitive hard disk systems. It has full reset protection for RAM-based systems and an optional RAM disk and print spooler for the CoCo 3 called *Hyper-III*.

There are several different programs on the disk, including some OS-9 utilities. The disk is divided into RS-DOS and OS-9 areas, so a `FREE` statement will indicate that the disk is full even though it does not appear to be when counting the number of granules used. `HDIR` displays a directory of a *Hyper-I/O* MSA under OS-9. `HDEL` will delete a file from a *Hyper-I/O* MSA. `HCOPY` will copy a file between OS-9 and *Hyper-I/O*. `PATCH` is an assembly language utility used to overlay a memory-resident module. `CSM` is an overlaid version of the OS-9 Level 1 assembler `ASM`, which has been modified to generate RS-DOS compatible output. Finally, in the `DEFS` directory there is a set of 11 equate files that, when used with `CSM` and `HCOPY`, can be used to write *Hyper-I/O* device drivers under OS-9.

In order to use *Hyper-I/O* it is necessary to learn a few new terms. MSA (mass storage area) and disk handles are two new terms with which you will need to become very familiar. Mass storage areas come in two types, "flat" and "RBF" MSAs. A flat MSA is allowed to take up all the space on a storage device (a floppy drive) while an RBF MSA is allowed only a portion of a device (a hard drive). It is the RBF MSAs that are compatible with OS-9. MSAs can be as large as 3 Mb or as small as 2K. This way you can organize your hard drive in any way you want, having RS-DOS and OS-9. Disk handles are the four drive handles for all of the MSAs.

While you can define hundreds of MSAs, you can have only four handles at any time. This allows you to use a single drive in many ways. For instance, you can set up two double-sided 40-track drives as two large drives or four small drives. *Hyper-I/O* gives you new commands that allow you to change this setup on the fly.

Hyper-I/O upgrades Disk Extended Color BASIC to provide new features and commands. It changes all functions and commands using drive numbers to use disk handles instead, but uses existing error messages for new commands and features. The manual fully explains the new commands and related error messages.

The `BACKUP` command copies one MSA to another, but the MSAs must be of the same size. To copy programs from one type of MSA to another, use `COPY`. *Hyper-I/O* adds a feature to `COPY` that allows you to specify a destination disk handle without typing the filename a second time. The output of `DIR` was changed slightly to show the disk handle for flat MSAs and the volume label for RBF MSAs.

New commands in *Hyper-I/O* include `OPEN DRIVE`, which has four forms of use, and `UNLOAD`, which closes all files on the MSA specified by the disk handle and then calls the MSA's device driver `PARK` function. The `PARK` function puts your storage device into a state that allows the device to be safely transported — a must for hard drive systems.

I tested this program on two Teac slim-line DS/DD drives and could not find any problems with standard BASIC programs. All binary programs so far have returned me to standard RS-DOS after running, which I expected; you would need to put *Hyper-I/O* on an EPROM to prevent this. I have not had any programs crash as a result of *Hyper-I/O* being in the system.

I enlisted the aid of Dick White to test the program on his 3½-inch drive and his new hard drive using the Burke & Burke CoCo XT interface. He had already set up his hard drive for OS-9 but did try to set up four RBF (OS-9 term for any disk drive) MSAs on the 3½-inch drive. He discovered a bug that would not allow this and sent a message on Delphi to Chris Burke. The bug was very quickly corrected, and both Dick and I had the corrected copy in a few days. Chris is very helpful and supports his products.

If you find yourself considering some of the larger drives that are now becoming available at lower costs, *Hyper-I/O* will put all that new space to work for you, especially if you want to use it (or even part of it) with RS-DOS.

(Burke & Burke, P.O. Box 1283, Palatine, IL 60078, 312-397-2898; $29.95; *Hyper-III*, $19.95)

— Barry Pottinger

Software CoCo 1, 2 & 3

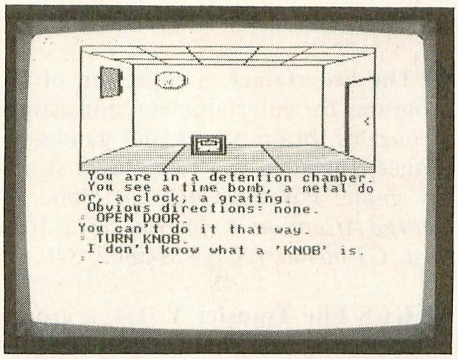
Mr. Corey — Save the World from Nuclear Destruction

Mr. Corey, an Adventure from Valkyrie Software, takes place on an uncharted island where secret nuclear experiments are being conducted. As a secret agent for ATHENA, you have been discovered and placed in a security cell with a ticking time bomb. Your job is to escape your captors in time to warn the world of the evil deeds planned by the villainous Mr. Corey.

Mr. Corey is similar to another Valkyrie program, *Tomb of T'ien* (reviewed in the May '88 RAINBOW, Page 129), in terms of overall style. Colorful graphics are used along with text to provide a split-screen type of display. The top half shows your surroundings, and the bottom half is used to type in commands.

Mr. Corey needs at least 64K of RAM and Extended Color BASIC. It will run fine on the CoCo 3, but if you are using the Tandy CM-8 RGB monitor, be prepared to see the graphics in black and white. If you connect your CoCo 3 to either a composite color monitor or a color TV, you will see the program in full color.

The software, available on tape or disk, is copy-protected, but a free replacement will be sent if you develop problems during the first year. A non-executable backup can also be made that will allow you to repair the original if a problem develops.



```
You are in a detention chamber.
You see a time bomb, a metal do
or, a clock, a grating.
Obvious directions: none.
: OPEN DOOR.
You can't do it that way.
: TURN KNOB.
 I don't know what a 'KNOB' is.
:
```

Mr. Corey is a fascinating Adventure that kept me busy for hours. The program uses the familiar direction commands such as N or North, etc. You can Get, Put, Drop, Open, Go and Look. As usual, you can also keep track of the items that you are carrying with the Inventory command. These are just a small sampling of the straightforward commands involved.

You will have to use all of your wits to solve this one. Never give up when commands don't seem to work. I found in one particular case, a violent act such as 'Kick'ing was needed. A game save command is also available to allow you to quit without having to start all over again the next time you play. The program is in two parts: The first tests your ability to escape the security cell; and the second, which automatically loads, will keep you busy for hours, and in my case — days!

Mr. Corey is a good Adventure. The graphics are fair, but their lack of detail compared to other Adventures on the market does not deter from the appeal of the program. I admire the author, Scott Settembre, for his unconventional style and technique. Valkyrie has done a nice job in providing interesting, challenging and fun Adventure programs to the CoCo Community, and this one is deserving of a spot on your computer table. But, really, does a name like "Mr. Corey" sound villainous to you? It sounds more like a high school science instructor to me.

(Valkyrie Software, P.O. Box 2120, Monroe, NY 10950, 914-783-0191; $19.95 plus $2 S/H)

— David Gerald

One-Liner Contest Winner . . .

This short utility converts the screen location of a `PRINT@` statement to the coordinates of a `SET` statement, or vice versa.

The listing:

```
1 INPUT"pRINT@ OR sET";A$:IFA$="
P"THENCLS:INPUT"PRINT@";P:K=P/32
:V=INT(K)*2:H=(K-V/2)*64:PRINT"S
ET(";H;",";V;",C)":SET(H,V,3):GO
TO1:ELSECLS:INPUT"SET(H,V)";H,V:
M=(H/64):K=INT(V/2)+M:P=INT(K*32
):PRINT"PRINT@";P:PRINT@P,CHR$(1
82):GOTO1
```

Don Rowan
Minneapolis, MN

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

One-Liner Contest Winner . . .

If you (or your child) need to brush up on your multiplication tables from 1 to 12, this one-liner is the one to have.

The listing:

```
10 CLS8:FORD=2TO12:CLS8:PRINT"
MULTIPLICATION TABLE FOR";D:PRIN
T"==============================
=":FORK=1TO12:PRINTTAB(10)D;"X";
K;"=";D*K:NEXTK:PRINT" PRESS SHI
FT & @ TO PAUSE.":FORX=1TO1000:N
EXT:NEXTD:CLS3:INPUT"ANOTHER?  Y
 OR N";Z$:IFZ$="Y"THEN10
```

Joe F. Sobieski
Johnstown, PA

(For this winning one-liner contest entry, the author has been sent copies of both *The Third Rainbow Book of Adventures* and its companion *The Third Rainbow Adventures Tape.*)

Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, *your assurance that we have seen the product and have ascertained that it is what it purports to be.*

◆ **AL-WRITE**, an assembly language program development system for the CoCo 3 that lets the programmer write and assemble programs using a full-screen editor and a menu-driven environment. *C-Ware Laboratory, P.O. Box 4967, San Antonio, TX 78285, (512) 690-1788; $30.*

◆ **BASIC Utility Diskette**, a collection of utilities for BASIC programmers that includes the ability to perform line-by-line comparison of two programs, prepare a cross-reference of line numbers, read data from text memory and print it out, and print to a CoCo disk file in blocks. *T.E.M. of California, Box 4311, Fullerton, CA 92634, (714) 871-8210; $19.95.*

◆ **The Color Job Diary**, a BASIC program that keeps track of customer accounts for any type of business. There is no limit to the number of files the program can accommodate. Epson-compatible printers are supported and a mouse is required. *Color Alloy CoCo 3 Products, 1124 Denney Drive, Duluth, MN 55805, (218) 724-3663; $20 plus $3 S/H.*

◆ **DIR Cataloger V. 1.5**, a utility that reads a disk directory and disassembles it into several sections: filename, extension, file type, etc. Directory information can be sent to the screen, printer or disk file. Requires a CoCo 2 with 32K memory or a CoCo 3. *Mouse Software Ltd., 7013 Summit Ave., Cincinnati, OH 45243, (513) 984-4089; $20.*

◆ **Disk Manager Tree**, a utility that allows file manipulation on OS-9 disks, whether RAM disk, hard drive or floppy. It uses a "tree" display to show relationships of directories and subdirectories. OS-9 Level II, at least one disk drive and a CoCo 3 with 512K required. *Alpha Software Technologies, 2810 Buffon St., Chalmette, LA 70043, (504) 279-1653; $29.95.*

◆ **The Entertainer**, a collection of 12 programs for entertainment, consisting of puzzles, brain games and games of chance. Included is a two-player strategy game. For the CoCo 1, 2 and 3. *George Aftamonow, 46 Howe St., Milford, CT 06460, (203) 878-3602; $10.*

◆ **GCS File Transfer V. 1.4**, a group of OS-9 programs that transfer files on MS-DOS and FLEX-format floppies to and from the CoCo. CoCo 3 and OS-9 Level II required. *Granite Computer, Route 2, Box 445, Hillsboro, NH 03244, (603) 464-3850; $44.95.*

Graphics-25, a 100-percent machine language graphics utilities program that allows you to use the full memory range of the 512K CoCo 3 to create up to 25 `HSCREEN 1` and `3` screens, or up to 13 `HSCREEN 2` and `4` screens. It also allows instant changes of all 16 palettes and adds new graphics commands to BASIC. *Gimmesoft, P.O. Box 421, Perry Hall, MD 21128, (301) 256-7558; $24.95.*

◆ **KJV CoCo Disk No. 14**, the Bible's Book of Matthew on disk in ASCII format. Requires a CoCo 1, 2 or 3 with 32K and at least one disk drive. Also requires a word processor. *BDS Software, P.O. Box 485P, Glenview, IL 60025, (312) 998-1656; $3.*

Memo Calendar, a program that will display a calendar on your monitor for any month from 1984 to 1999. Memos and reminders can be grouped in files. For the CoCo 1, 2 and 3. A disk drive is required; a printer is optional. *Sunrise Software, 8901 NW 26 St., Sunrise, FL 33322; $19.95 plus $2 S/H.*

MPI Locking Plate, two styles of boards that firmly attach a Multi-Pak Interface to the CoCo, preventing costly damage that could result from jostling. *Gimmesoft, P.O. Box 421, Perry Hall, MD 21128, (301) 256-7558; $9.95.*

◆ **OS-9 Level II BBS**, a set of commands and utilities you can use to create an OS-9 BBS program. For the CoCo 3 with OS-9 Level II. *Alpha Software Technologies, 2810 Buffon St., Chalmette, LA 70043, (504) 279-1653; $19.95.*

V-Term Terminal Emulator, a multi-tasking terminal emulation program for the CoCo 3 that emulates VT100 and VT52 terminals and supports CoCo 3 memory. Support for multiple files in memory is included to remove the need to constantly save capture buffers and Xmodem downloads to disk. *Gimmesoft, P.O. Box 421, Perry Hall, MD 21128, (301) 256-7558; $39.95.*

◆ **First product received from this company**

The *Seal of Certification* program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the product does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

— Lauren Willoughby

The Seventh Year Of Rainbow

An index to the articles, programs, reviews and authors appearing in THE RAINBOW from July 1987 through June 1988.

Compiled and Edited
by Leslie A. Foster

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TOTAL NUMBER OF ARTICLES
(July 1981 to June 1988) — 4129

This is the fifth index to the *Rainbow*.

Previous indexes to the *Rainbow* are available as follows:
July 1981 to June 1984—July 1984 issue
July 1984 to June 1985—July 1985 issue
July 1985 to June 1986—July 1986 issue
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PAYMENTS Bernico, Bill. "I owe, I owe." *(January 1988)* 82 — Calculate monthly payments.

PEELPCLS Sapello, Donald. "Peeling graphics." *(February 1988)* 154

PERMS Barden, William, Jr. "Barden's buffer: The mystery of the Tandy anagram." *(May 1988)* 170

PERSLOGO Brown, Charles E, Jr. "Printing in two columns." *(May 1988)* 95

PHONICS Blyn, Steve. "Fun with phonics." *(March 1988)* 89

PHOTOTAG Turowksi, Donald. "Keep your memories in order." *(December 1987)* 46 — Create labels for photo album.

PICTBOOK Carrock, Solla. "Animation film festival." *(October 1987)* 114

PIPEIT Puckett, Dale L. "Back at the drawing board." *(January 1988)* 160

PITCHER Willoughby, Lauren. "Calibrate your ears." *(June 1988)* 78

PLAID Shoobs, Bernice. "CoCo cuddler." *(January 1988)* 74 — Graphics demo.

PLAYBACKPIX Puckett, Dale L. "The evolution continues." *(November 1987)* 180

POST Beckles, Orman Cyril, III. "The Post Office." *(March 1988)* 104 — Mailing list program. — Major correction, April, 1988, p.30.

POSTRPTR Quellhorst, George. "Bulletin board standout." *(May 1988)* 116 — Printing posters with a DMP-130.

PREVIEWPIX Puckett, Dale L. "Putting data structures on the drawing board." *(December 1987)* 180

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PRINTER Dibble, Peter. "The problem with BASIC09." *(August 1987)* 163

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REPORT Piersma, Daniel. "The home financial analyst." *(April 1988)* 112 — Help at tax time.

RESCUE Johnson, Clyde, Jr. "Lunar rescue." *(August 1987)* 116

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REVERSE1; REVERSE2; REVERSE3; REVERSE4 Weide, Dennis H. "A picture is worth 6144 bytes." *(February 1988)* 126 — Reversing a PMODE 4 graphic.

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SAVEIMAGE Dibble, Peter. "Compression filters in saving and restoring graphics screens." *(December 1987)* 168 Dibble, Peter. "Sometimes BASIC09 isn't fast enough." *(September 1987)* 170

SAVEPIX Puckett, Dale L. "Putting data structures on the drawing board." *(December 1987)* 180

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SCRNDUMP; SCRNDMPS Curtis, H. Allen. "Screen dump extraordinaire." *(October 1987)* 30 — Correction, November 1987, p.116.

SCRNFONT Bernico, Bill. "Ye olde font." *(May 1988)* 36 —Graphics print font styles.

SCROLL Bernico, Bill. "Screen scrolling made easy." *(October 1987)* 26

SENTENCE Scerbo, Fred B. "Grammar 101 Part II." *(June 1988)* 154 Scerbo, Fred B. "Know what I mean?" *(January 1988)* 90 — Recognizing complete sentences and fragments. Scerbo, Fred B. "Sentence savvy." *(March 1988)* 78

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SETUPMOUSE Puckett, Dale L. "Putting data structures on the drawing board." *(December 1987)* 180

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SPELLKEY Scerbo, Fred B. "Revising the reservoir." *(April 1988)* 146 — Fixes to recent programs.

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THEATRE Flaishaker, Paul. "Theater management." *(August 1987)* 88 — A puzzle.

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XMASPORI Golias, Ruth E. "A Christmas pot-pourri." *(December 1987)* 100 — Christmas music and graphics. Correction, April 1988, p.14.

XMASSONG Mosley, John. "Do you hear what I hear?" *(December 1987)* 86 — Correction, June 1988, p.38.

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COCO Q&A CONSULTATIONS

By Marty Goodman
Rainbow Contributing Editor

In this and in future “CoCo Consultations,” I will be trying something new. In addition to the familiar Q & A column, I will also include tidbits of information contributed by various folks and, in some cases, comment on the information. Thus, even if you don't have a question, *I invite you to send in any little hints or descriptions of experiences you have had with the CoCo that you think might be of interest to the CoCo-owning public in general.*

CoCo Economy

Can a Color Computer 2 be upgraded to a Color Computer 3 without actually buying a Color Computer 3?

Rio Yates
Corpus Christi, TX

While in theory you can do the upgrade you ask about, it would take a skilled hardware technician about 24 to 48 hours of labor to do it (such technicians make $30 to $60 an hour), and cost you about $100 in parts. So the answer to your question is no. The only way to go from a Color Computer 2 to a Color Computer 3 is to *buy* a Color Computer 3. There are just too many differences between the two for an upgrade of one to the other to be practical.

Versatile Multipack

We just got a CoCo 3 and upgraded our multipack interface as you suggested. Will we have any trouble using that multipack with our CoCo 2 on occasion? We read your January 1987 article in RAINBOW and do not have any of the “problem” third-party hardware cards you mentioned.

Mr. and Mrs. Greg Adams
Rock Falls, IL

If you are not using any of the “problem” hardware cards (PBJ Word Pak model I or II, CoCo Max 1 or 2 Hi-Res pack, etc.), then your multipack upgraded for the CoCo 3 should continue to work fine on your old CoCo 2.

On Track with ADOS-3

Could you explain how to use a 40-track, double-sided drive as a 40-track, double-sided drive under Disk BASIC? Currently I am using it as a 35-track, single-sided drive.

Linda Meaux
Lafayette, LA

The best way I know of to use Disk BASIC with 40-track, double-sided drives is to buy ADOS-3 from SpectroSystems, then later burn it into a Disk EPROM. ADOS-3 also fixes some bugs and adds a great many extra features to Disk BASIC, while maintaining compatibility with programs written for unmodified Disk BASIC. To get the full benefit of ADOS-3 you need to burn it into an EPROM after configuring it. This is offered as a service at a modest price above the cost of the program itself.

Upgrading Multi-Pak

What is involved in upgrading both the new and the old Multi-Pak to work with the CoCo 3? Do I really have to upgrade a Multi-Pak even if it seems to work right with my CoCo 3? Will the upgraded Multi-Pak work with the CoCo 1 and 2 after the upgrade?

Christian Michaud
(SUPERCHRIS)
Montreal, Quebec

In the January 1987 issue of RAINBOW I wrote an article on this subject; although what I wrote then is correct as far as I know, I now have even more information. If you own an older (bigger gray or white) Multi-Pak (Cat. No. 26-3024) the upgrade procedure is quite simple: Replace the old PAL chip (the only socketed chip on the board, so it is easy to find) with Part # AXX 7123 from Tandy National Parts. That is all.

For the new, smaller white Multi-Pak (Cat. No. 26-3124), the upgrade procedure is far more complex, as it involves installing a satellite board in the Multi-Pak. While the board is available, it is not accompanied by instructions; the installation is a bit tricky, so I recommend having Tandy upgrade it. Alternatively, owners may refer to Delphi, where we have in the “Hardware Hacking” database a copy of the schematic for that satellite board that will allow a competent hacker to upgrade his own 26-3124 Multi-Pak for under $2 in parts.

In the light of newer information, I strongly recommend that *all* existing Multi-Paks be upgraded if they are intended to be used on the CoCo 3. Note that none of the Multi-Paks currently being sold are CoCo 3-compatible at the time of purchase. Due to an apparent order miscalculation for Multi-Paks, Tandy has at least a two-year supply of the old CoCo 2 Multi-Pak and is reluctant to tool up to make a CoCo 3 version. So CoCo 2 Multi-Paks continue to be sold, requiring purchasers of CoCo 3s to have the upgrade done. It is also essential to note that even if your CoCo 3 *appears* to work just fine with your Multi-Pak, the upgrade is required. The upgrade may prevent slow, subtle damage to your CoCo 3; it is also necessary for some current CoCo 3 accessories (such as the new Disto No-Halt Controller).

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

A Multi-Pak upgraded in this fashion will still work fine on a CoCo 2, provided you do not use a *Word Pak* model 1 or 2, CoCo Max 2 Hi-Res Pak, or other third-party hardware addressed above $FF7E. The upgraded Multi-Pak *will* continue to work with CoCo 2 or CoCo 3 and a disk controller, an RS-232 pack, *Orchestra 90*, the Tandy Speech/Sound Pak, most Speech Systems packs, and the *Word Pak RS*.

Common Hardware Failures

What are the most commonly reported causes of hardware failure in the CoCo 3?

Dave Archer
(DAVEARCHER)
Finley, ND

Surveying reports from the Delphi CoCo SIG, from my own experience repairing a few, and from several friends of mine who work for Tandy computer repair centers, it seems the most common cause of catastrophic Color Computer 3 failure is a blown 68B09 chip. Because this chip is soldered directly to the board, it takes a skilled technician to replace it.

Poorly seated GIME chips account for a lot of video problems and "flaky" machines. The cure there is to carefully remove the GIME chip, look for bent pins in the socket, straighten any you may find, wash both GIME chip pins and socket with ethanol, then very carefully and accurately reinsert the GIME chip in its socket. Observe at all times standard precautions for handling CMOS chips.

I've also encountered quite a few reports of "keyboard failure" caused by a dead or damaged keyboard PIA chip. In the CoCo 3 this is IC5, called LSC81001. It is an open collector 2 Mhz variant of the familiar 6821 PIA chip, but it must be replaced by the exactly correct part that can be obtained from Tandy National Parts. This 40-pin chip is also soldered directly to the board. Much to my suprise, there are relatively few reports of machine failures due to a dead GIME chip. That is fortunate, for Tandy still wants roughly $50 for the part, which can be obtained nowhere else.

An Optional Monitor

The new version of the Commodore 1084 monitor (designed to support all Commodore computers, including the C64, C128, and Amiga line) has a six-pin DIN jack that accepts an RGB analog signal with separate upgoing horizontal and vertical sync pulses. I used a cable exactly like your Magnavox 8CM515 cable to hook a CoCo 3 to it, and the results were excellent. *I purchased this monitor from a local Service Merchandise store for $340. The rated dot pitch on it is .42, exactly the same as that for the Magnavox 8CM515 monitor.*

Jim Smith
(JWSMITH)
Miramar, FL

Magnavox has been making monitors for Commodore for a long time. The old 1902 monitor for the C64 and C128 was a modified 8CM562. It seems like this new 1080 monitor is a slightly customized 8CM515 model, for the overall appearance and layout of both the front and back of it (judging from the pictures in the user manual that you kindly sent me) are suspiciously similar to that of the 8CM515. I am delighted that you informed me of this added option that CoCo 3 owners have for acquiring an RGB analog/composite color monitor. This monitor also has "chromanance/luminance"-type inputs, a color video protocol used only by the newer Commodore 64s and Commodore 128s among home computers. It is also being used in the newly introduced ultra high resolution VHS VCR systems. Frankly, few folks really need it. Note, too, that RAINBOW advertisers like Howard Medical sell the Magnavox 8CM515 and CoCo 3 cable for roughly the same price (including shipping) as you paid for your Comodore 1084.

Reversing the Color Set

On the CoCo 3, how can I use those old CoCo 2 programs that ask you to press the reset button if the color set (red and blue) is reversed?

Richard S. Schultz
Carmichael, CA

As you no doubt discovered, pressing reset on a CoCo 3 will not cause the color set to reverse. There is an easy solution, however. If, after a normal power-up and booting of the program, you end up with the wrong color set, merely turn the machine off (or press the reset button while holding down CTRL and ALT). Then, power machine again (or press the reset a second time, this time holding the F1 key. This will result in an odd black-on-blue normal BASIC screen, but don't worry about that. Merely load and execute the program, and you will find it now has the color set you want.

An EPROM for the Tandy FD-502

What sort of EPROM is needed if one wants to burn a modified DOS ROM for the controller that comes with a Tandy FD-502 model drive?

Leslie Earl
(LESTERE)
Houston, TX

This latest model of CoCo disk drive system from Tandy, the double-sided FD-502, is accompanied by a new controller that now uses a 28-pin ROM instead of the old 24-pin ROM. This ROM should be pretty much pin-for-pin compatible with 2764-type EPROMs. I recommend using 250 ns or faster versions of the 2764, although slower ones will also work fine in most cases. If for some reason you have a problem substituting a 2764 EPROM for Tandy's 28-pin ROM, try running jumper wires from Pin 28 of the EPROM to both pins 1 and 27 of the EPROM (with all pins still inserted in the socket). Sometimes when an "EPROM-compatible" ROM is used, some lines specific to the EPROM (like Vpp) that need to be pulled to +5 volts when the EPROM is in use, are left unconnected for the ROM chip. It is a good thing Tandy is switching to 28-pin ROMs at long last, for I hear that Motorola will be discontinuing production of the 24-pin 68766 before the end of 1988.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Marty through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type `ASK` **(for Ask the Experts) to arrive at the EXPERTS> prompt, where you can select the "CoCo Consultations" online form which has complete instructions.**

A project to fit two adapters into your controller — at the same time

Two for One

By Tony DiStefano
Rainbow Contributing Editor

Five years ago I introduced to the CoCo Community a piece of hardware called the Disto controller. It is compatible with Radio Shack's controller, as well as others. One of its interesting features is an internal mini expansion bus (MEB). This bus allows internal expansion of a peripheral card. Two of the adapters available for this controller are more popular than ever these days. The first is the clock/parallel adapter. This allows the user under OS-9 to have the real time at hand without having to type it in every time and to be able to connect a parallel printer to the CoCo without having to use an adapter. The second is a hard disk/serial adapter, which allows the user to connect a hard disk to the CoCo. It also has an RS-232 interface that is somewhat compatible with the Radio Shack Deluxe RS-232 Pak.

Until now, only one of these adapters would fit into the controller at one time. If you wanted a second, you needed an MEB carrier or a RAM disk along with a Multi-Pak Interface. Very expensive! If you had a CoCo 3, you also had to have the Multi-Pak modified. More bucks. As for myself, I have two systems, a CoCo 1 with an unmodified Multi-Pak and monochrome monitor, and a CoCo 3 with no Multi-Pak and a Sony RGB monitor. I don't intend to buy another Multi-Pak for my CoCo 3 system, so where does that leave me?

There were a couple of reasons for writing this article. The first is that if I do something for myself and find that it helps me do something else better, faster or more easily, I think that other people must have the same needs; most of the time I am right. This is why I began writing articles in the first place. The second reason is that Radio Shack has discontinued the RS-232 Pak and may discontinue the Multi-Pak in the future. What will we do?

If you take a look at the two adapters described above, they represent a lot of I/O: serial, parallel, hard disk and clock. To be able to have all those things without the Multi-Pak would be great. Getting the Super Controller or the Super Controller II is a good start, but you can still only put one of the two adapters inside the controller. This is where I come in. I decided that I wanted both of these adapters in my second system's controller. So I took out my soldering iron, and this is what I came up with.

Before you get started, let me give you the drawbacks to this project. First of all, when all is said and done, you can no longer close the cover of the controller. An even bigger problem is power: When both of these boards are plugged in, the current draw is a little over the recommended limit of 300mA. A separate regulated supply must be built to handle the extra demand on power. Apart from these hurdles, a little soldering experence is needed.

Let's review some theory before taking out the ol' soldering iron, however. The MEB is a 17-pin connector that has data, address and control lines. The following is a description of these pins:

Pin #	Description
1	Reset
2	E Clock
3	A0
4	A1
5	D0
6	D1
7	D2
8	D3
9	D4
10	D5
11	D6
12	D7
13	CE (Chip Enable)
14	GND
15	R/W
16	+5V
17	A2

Study the pins carefully; it is a standard memory-mapped area. If we added another area to this, the only thing to change would be the CE. All other lines — data, address and control — would be the same. A piggyback technique here will do fine, except for the CE pin, which will go to another memory-mapped area. This is not too hard since the controller is already decoded; all you have to do is fish out the CE. Later, I'll tell you how to patch the OS-9 software, as well.

Not much to the theory, is there? In fact, this project is more mechanical than anything else. Now, *it is time* to get started. Please don't do any of these modifications with the power on. All the modifications are done on the hard disk/serial adapter. There are two cuts to do on this board, or only one if you have a modified power supply and it can stand the extra drain.

The first cut is to disable the CE from the board. Look at the component side of the board. Locate Pin 13 on the MEB connector. Follow the trace to the first hole and cut the trace just before that hole. For the +5V, locate Pin 16 on the same connector. Follow its wide trace to the first hole about one inch away, and cut the trace just before you reach that hole.

On the solder side, solder a set of 17 short male single inline header pins to the botton of the MEB connector. The clock/parallel adapter board will sit on these pins. Now, solder one side of a 4-inch wire to the hole just after the first cut. For all versions of the Super Controller I, solder the other end of this wire to Pin 7 of the 74LS139 chip just below the 74LS04. For the Super Controller II, solder the wire to Pin 3 of J3 on the controller; you also have the choice of putting on a jumper instead of soldering it. One limitation is that you must use the alternate, eight-byte area for this modification; the other area is only four bytes long, so it cannot be used.

For the power, solder the plus side of a +5V regulated power supply to the hole above the second cut you made on the adapter. Locate Pin 14 on the MEB connector, follow it to the first hole, and connect the ground return of the power supply to it. Insert the clock/parallel board piggyback on Pin 17 that you just installed. Plug the hard disk/serial board into the MEB connector. Connect the controller into the computer. That is all there is to the hardware part of this project.

Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec. Tony's username on Delphi is DISTO.

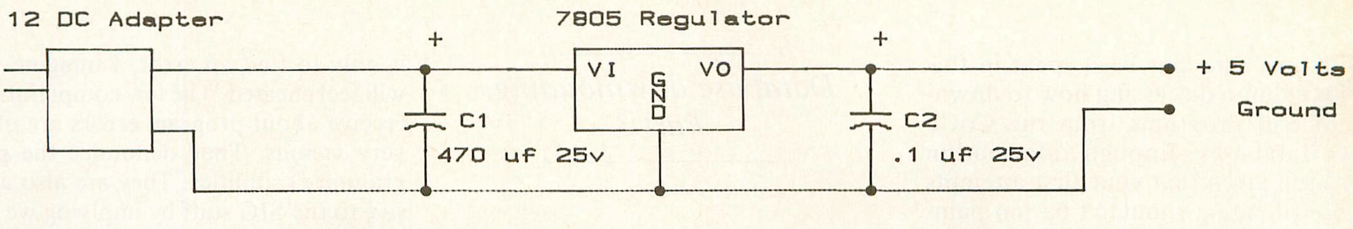

Figure 1: 5-volt Power Supply

Now for the software patches for the OS-9 drivers. One of the great things about OS-9 is the ability to adapt software to hardware. In most cases, the way designers connect devices to a computer is very similar. *Where* these devices are connected, as far as the memory map goes, can be very different. The writers of OS-9 had this in mind when they wrote it. Along with the necessary software drivers, the fathers of OS-9 created small blocks of memory called descriptors. These descriptors have information on the physical aspects of the hardware they control — things like how many tracks on a disk or what baud rate the device works at.

One of the pieces of information included in these device descriptors is the memory location of the hardware. This tells the software driver exactly where in memory the hardware can be found. Now, what I did above is change the hardware location of the hard disk registers and the serial (RS-232) registers. The only way the software driver knows this information is through the device descriptor. All we have to do now is change the values in the proper device descriptors to the new memory locations, and we are home free.

Since the clock and parallel hardware is not changed, no changes to the descriptors are needed. However, we do need to change the hard disk and serial descriptors. Let's start with the hard disk adapter. A little knowledge of OS-9 is needed to make these changes. On the disk that came with this adapter are drivers and descriptors. The `/h0` descriptor used for the hard disk adapter needs to be changed. To change it, we will use the OS-9 command `Debug`. As part of the descriptor, there is a three-byte address that represents the area in the memory map where the hardware resides. This data is set for the hardware memory; but since we changed the hardware, we must now change the software. The third byte in this address is $53. You now have to change this value to $5A. To do this, execute `Debug` and link to the `/h0` module. Press ENTER until you pass the series of two bytes, $07 and $FF; when you see the next value, $53, type `=5A` to change it to the right value. Press Q to exit.

The other device descriptor to change is the serial one. Follow the same procedure as above, except use the `/T2` descriptor. The byte to change may be one of two values. If it is the original, unmodified Tandy descriptor, the value to look for is $68. If you have already changed this value, you will know that it is $54. In either case, change it to $5C. If you want to make this change permanent, the OS-9 manual will describe just how to do this.

There will be a lot of cables protruding from this contraption: the disk drive cable, the hard disk cable, the printer cable, the RS-232 cable and the power cable. I bent and shaped all the cables so that they were parallel to the drive cable, and then I bundled them together with a tie-wrap. As I mentioned before, the cover will no longer fit; so I made another cover from a small piece of tin, bending, cutting and shaping it to fit. I did not bother to paint it, but you might.

The only thing left is the power supply. Radio Shack has all the parts necessary to build a regulated power supply. You will need all the parts listed in Figure 1. Most of the parts are not too critical and can be substituted for the nearest part. The transformer you must use is a DC adapter. A 12-volt adapter at about 150mA will do just fine.

I have recently joined Delphi. You can find me there as DISTO. Drop me a line if you have any problems or if you just want to say "hi." I'm not on at any regular time, but look for me in the OS-9 and CoCo SIGs.

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Database downloading,
Part 3

Downloading Problems

By Cray Augsburg
Rainbow Technical Editor

Some time has been spent in this column discussing how to download programs from the CoCo SIG databases. Enough information has been given that your first attempts at downloading shouldn't be too painful. At the same time, each user develops many shortcuts in downloading files. These shortcuts will be different for most people and I leave it to you to find the methods that work best for you. It doesn't take long to learn the ropes, and pretty soon you will find downloading becomes second nature.

Tape-Based Users

I feel it safe to say most Color Computer owners have at least one disk drive connected to their CoCos. However, many of the newer members to the CoCo Community don't. The reason is irrelevant — if their interest in the CoCo continues to grow, chances are they will add a drive as soon as they can. The point is, downloaded files often must be handled a little differently on tape-based systems than on disk-based CoCos. This is especially true of machine language files.

Because of the difference in the way disk and tape systems handle the addressing information for ML files, different approaches must be taken when saving a downloaded file. Rather than spend more time on this issue here, we will be publishing an article next month discussing tape users and Delphi. Written by database manager Don Hutchison (DONHUTCHISON), this article details the steps that must be taken by tape-based users before certain types of downloaded files can be run.

Program Bugs

Whenever a file is uploaded to the CoCo SIG and submitted for publication in the database areas, that file is first sent to a private area used by the SIG staff. This file is officially in the database area and can be manipulated by the staff, but it cannot be seen by the general SIG public. This allows the staff to download the program and make sure it works — to determine if the file is ready to be published. This download/error checking process is usually handled by Don Hutchison.

Every effort is made to ensure that the programs in the public areas of the database work. If a problem is found, the uploader is asked to see that the file is fixed before it is published. However, some problem programs do get through. The number of submissions each month preclude full Beta-testing of uploaded programs.

If you download a program and run it only to find an error, I imagine you will feel cheated. The few complaints we receive about program errors are often very vicious. They denounce the programmer's abilities. They are also abusive to the SIG staff by implying we put bug-ridden programs in the databases intentionally. Keep in mind that we don't intentionally publish files that contain errors. Aside from the obvious ethical considerations, it takes a lot of work and time to clear up those errors. And I doubt if many people would upload error-ridden programs knowing their name will appear along with the program.

One of the best ways to address such a situation is to contact the author and/or Don Hutchison via Mail. Explain the problem as clearly as possible. Let us know what errors you are receiving and in what program lines they occur. Include information about your Color Computer setup. Describe the steps you are following in trying to run the program. With this information, it becomes possible to get a clear image of the problem and work toward a solution. After a solution has been found, the program will be changed accordingly so other users don't encounter the same problems.

On a related note, problem programs are removed from public view. This is

---

Cray Augsburg is RAINBOW's technical editor and has an associate's degree in electrical engineering. He and his wife, Ruth Ann, have two children and live in Louisville, Kentucky. His username on Delphi is CRAY.

Database Report

By Don Hutchison
Rainbow CoCo SIG Database Manager

SIGop **Greg Law** (GREGL) has opened a new topic in the database section of OS-9 Online. The topic is called "Revised OS-9 Users Group Material" since it will be stocked with the newer OS-9 Users Group files. (The existing Users Group files will remain online, also.)

Both RAINBOW SIGs had very active months, in the forum areas as well as in the databases. We had a lot of interesting, useful software uploaded to us. Let's check out the new material!

OS-9 Online

In the General topic of the database, **Brian Wright** (POLTERGEIST) posted the first issue of the humorous *Nutworks Magazine*. Brian also uploaded another entertaining file containing the first three issues of *Humus Magazine*. **Jason Forbes** (COCO3KID) uploaded `COCOOS9.BAS`, a modified version of the RS-OS9 program that makes RS-DOS disks readable from OS-9. (This version will relocate files if `GRAN 0` is already used, and it will allow for larger files.) **Kevin Darling** (KDARLING) posted a text file describing a recommended hardware fix for the Tandy FD-502 second drive, which requires a small bit of soldering to correct an incorrectly positioned jumper.

In the Utilities topic of the database, **Warren Moore** (WJMOORE) uploaded `Moore Windows`, an archived file containing a collection of shell scripts to change the attributes of a current window device.

done for the protection of other users. In most cases, however, the program won't be moved from view until it is certain a problem exists within the program. We find many times that users don't have the right equipment to run a given program. Or, the steps they are using to run it are incorrect. And in the case of an ASCII download, line noise often becomes a problem.

Many times, beginning downloaders will download a BASIC program and save it to disk, only to find the program won't load when they try to run it. More often than not, this is the result of saving a tokenized BASIC program in ASCII format or vice versa. In many cases, simply loading the file back into your terminal program's buffer and resaving it in the correct format will rectify the situation. Sometimes, and also with machine language programs, you will have to download the file again and save it correctly before you will be able to use it.

Don Hutchison does an excellent job of tracking down user/program problems and finding agreeable solutions, and I feel he is well deserving of a pat on the back. I'm sure those of you who have dealt with him will agree.

Downloading Time

It can take quite a bit of online time to download a few simple programs at 300 baud. It is for this reason most of the SIG staff go online at either 1200 or 2400 baud. If it is within your means, I suggest using a 1200 baud modem. The drastic decrease in download time will allow you to more fully avail yourself of other areas of the CoCo SIG for the same amount of connect time.

Uploading

We are still offering free time for uploading to those who want to share their creations with other users, and we hope you will take advantage of this offer. Many find it very rewarding to help other people with similar needs and problems. Besides, uploading is a great way to gain new insight on file transfers.

I have covered the topic of uploading files to the CoCo SIG in past issues and will do so again in the future. It is this involvement, along with the feeling of being connected to other members of the CoCo SIG, which makes the SIG what it is. Think of it this way: If nobody uploaded any programs, would you *really* be as interested in going online? There would be nothing there for you to download.

Before we move into discussion next month of Workspace and its uses, I ask that you do a little "homework." Go ahead and look into Workspace. If you haven't done so already, try to upload and submit some files. Once you get into it, you might realize it isn't really all that hard to do. Just think of it as reverse-downloading. And if concern about the quality of your submission is holding you back, remember the old phrase, "nothing ventured, nothing gained!" □

Users can change the type of screen, change the default colors, toggle boldfacing on graphics windows and switch standard font size on graphics windows. **Mark Kowit** (MARKKOWIT) uploaded a decimal `Display` command and a `Palette` command utility that makes it easier to change palette values. Jason Forbes also posted `DIGICLOCK`, which displays a continuous digital clock and date in its own window. Source code is provided for easy modification.

In the Patches topic of the database, Jason Forbes updated his `GamePatches` file for fixing *Koronis Rift* and *Rescue on Fractalus*. **Roger Smith** (SMUDGER) provided us with `SPATCHW`, a patch for *TS-Spell* to allow for a single personal dictionary in the `/DD` data directory.

In the Telcom topic of the database, **Chris Bergerson** (CHRISB) provided us with `ACCESS.AR`, a "user-friendly" interface for the *Xcom9* terminal program. It stores frequently used numbers with the ability to alter the numbers. The archived file contains BASIC09 source, the packed program, a sample number file, and documentation. **Ron Bihler** (RAAB) posted a corrected version of `READMSG` and furnished Version 1.01 of *RiBBS*, an OS-9 Bulletin Board System. *RiBBS* requires an RS-232 Pak, an auto-answer modem, and at least two drives. Greg Law furnished an autobaud version of `TSGo/TSMon`. This version contains modules to support both the standard Hayes command set as well as the extended set.

In the Graphics & Music topic of the database, **Mark O'Pella** (MDODELPHI) uploaded his rendition of Elton John's "Your Song" in `UMuse` format. **Steve Fravel** (OS9FANATIC) posted an archived file containing two VEF pictures for Grateful Dead fans. The first picture is from the cover of the *Steal Your Face* album, while the second is from the back of the *Shakedown Street* album. **Bob Montowski** (GRAPHICSPUB) kindly provided 34 archived "Clip Art" groups for the CoCo 3's *Home Publisher* software. Each group, by the way, contains about 20 pictures! Thanks, Bob!

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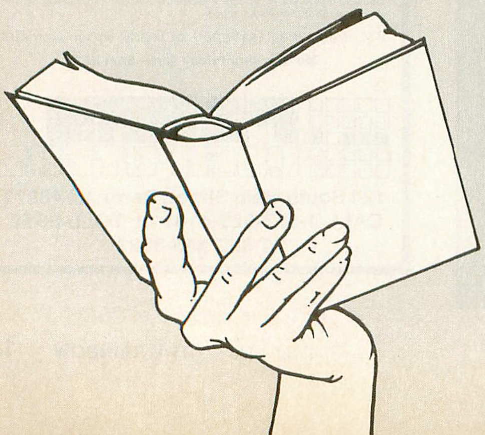

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In the Programmers' Den topic of the database, Greg Law posted a sample application for *Multi-Vue*. Greg's grouping consists of four source files written in RMA assembler that are the beginning of an application designed to run under *Multi-Vue*.

CoCo SIG

In the General topic of the database, **Marty Goodman** (MARTYGOODMAN) posted three humorous text files provided by **Rick Adams** (RICKADAMS). Titled *Mongrels Unite!*, these files describe the madcap experiences of one computer scientist in the course of filling out forms for a security clearance in which he is asked for his "race." **Heath Dingwell** (HEATHSTER) uploaded a comic text file containing "bloopers" written by school kids during their history classes. Heath also uploaded a tabulation of some popular "800" numbers.

In the CoCo 3 Graphics topic of the database, **Christopher Smith** (POSSUMDARK) sent us a Macintosh picture of Mao Tse Tung. **Marlin Simmons** (LINLEE) uploaded `FONTEDIT.ARC`, followed closely by a revised version. **James Farmer** (MODEMMASTER) uploaded two original RAT pictures, Cosmic War and Spacewarp, and an original *CoCo Max 3* picture called Starship. **Bob Wharton** (BOBWHARTON) uploaded his drawings of the Boston Celtics' logo, on request of a user.

In the Utilities and Applications topic of the database, **Jim Shoop** (BAZAR) uploaded his binary-to-BASIC converter program. **Michael Schneider** (MSCHNEIDER) uploaded a compression utility called `DSHRINK` for compressing WEFAX pictures into a single, smaller file. `DSHRINK` will also expand the file into the corresponding pictures on a WEFAX disk. **Ken Halter** (KENHALTER) uploaded some patches for CoCo 3 BASIC and a *PenPal* patch for the CoCo 3. Heath Dingwell uploaded his program for printing disk directories, and **Robert Pierce** (RPIERCE) posted a CoCo 3 memory-scanning program.

In the Games topic of the database, **Paul Dion** (PAULNORMAND) uploaded *Tupperwars*, his latest game creation. Heath Dingwell posted a friend's *Alien Invasion* game. **Gregory Clark** (GNOME) provided an entertaining game program called *Wimpy*. Greg asks, "How good are you at running and trying to hide? Are you cool when you can't fight back?" *Wimpy* is for the 128K CoCo 3.

In the Classic Graphics topic of the database, Jason Forbes posted `CHRIST.ARC`, a series of *CoCo Max 2* graphics containing Biblical quotes originally drawn by Tim Ashley. **David Mills** (DAVIDMILLS) uploaded a moving graphic of the world as it turns. This program is an interesting use of the graphics abilities of the CoCo.

In the Music and Sound topic of the database, **Mike Stute** (GRIDBUG) kindly provided us with five new tunes, sure to be popular among music lovers. Heath Dingwell uploaded "Shilo" by Neil Diamond. **John Barrett** (JBARRETT) posted four outstanding pieces for *Musica II*, and **Orman Beckles** (ORMAN) uploaded two printer drivers for use with the *Lyra* package. **Mark Raphael** (MARKRAPHAEL) uploaded a collection of music files for *Musica II*, as well as some stand-alone files. Mark included classical, pop and modern pop music files for a well-rounded offering. **George Hoffman** (HOFFBERGER) posted Pink Floyd's "Summer '68."

In the Data Communications topic of the database, Michael Schneider uploaded a compressed file containing two WEFAX pictures. Michael also furnished a compression and decompression utility in the Utilities topic of the database in the hope that others will begin to upload WEFAX pictures. **Fred McDonald** (FREDMCD) posted a patch file for Version 4.0 of *Ultimaterm*. ADOS-3 users should have this file, since the patch makes *Ultimaterm* compatible with ADOS-3.

As you can see, the RAINBOW SIGs are always very active! No matter what you're interested in, you'll probably find it here.

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DOCTOR Q&A ASCII

By Richard E. Esposito
Rainbow Contributing Editor
with Richard W. Libra

Drive Support

I recently received a 20-Meg hard drive with a WD 1001-05 controller card. The drive was taken out of a Southwest Technical, and I figured that since the SW ran on a 68B09 microprocessor (same as the CoCo 3) it would work on the CoCo. If I am correct, what do I need to do to interface them? If not, what Western Digital Controller does the CoCo use? I also have a Shugart 3.5-inch drive. Is there any way I can use this under RS-DOS? Would it work using OS-9 Level II? I use Stylograph *as my word processor on the SW. I was told that I could get this for my CoCo. Where can I find it? My system consists of 128K CoCo 3, FD-500 disk, DMP-105 printer, TP-10 printer, monochrome monitor and a modem. I also have a bunch of gray and white CoCo 1s and 2s.*

John Storlie
Union Gap, WA

℞ The four major suppliers of hard disk systems for the CoCo 3 are Burke & Burke, Frank Hogg Laboratory, Owl-Ware and RGB Computer Systems, all advertisers in this magazine. Contact them for support of your drive. *Stylograph* is available for the CoCo under both OS-9 Level I and Level II. Contact Great Plains Computer Company, P.O. Box 916, Idaho Falls, ID 83402, (208)529-3210.

Copy-Protection Makes No Sense

I'm looking for one of the best copyright programs around. I know a while ago you suggested Anti-Pirate *by Microcom but it's no longer advertised. If you were going to publish a program under your own name, what would you choose?*

Chris Green
Carmichael, CA

℞ I would neither market a copy-protected program nor would I encourage anyone else to market or purchase one. Even Lotus Corporation (the last major holdout) is abandoning copy-protection in its next release of *1-2-3*. Protection makes no sense. It discourages legitimate users from purchasing your products. It challenges pirates to break the protection scheme; to prove they've done it, they make copies for their friends. The only successful protection schemes are hardware-based; if done right this would price you out of the CoCo market.

A Fix for *VIP Speller*?

I used your CoCo 3 fix for VIP *("Doctor ASCII," March '88* RAINBOW*). It worked fine for* VIP Writer *and* VIP Calc*; however, I can find no such sequence of characters in my* VIP Speller. *Do you have a fix for* VIP Speller*?*

Jack Colemen
Joliet, IL

℞ Sorry, but I do not have a copy of the old *VIP Speller*. There is now a new CoCo 3 version of *VIP Writer/VIP Speller* that uses the CoCo 3's 80-by-24 display mode.

Display Enhancement

How do I change from amber background/black text to black background/amber text and utilize the entire screen (eliminate the border) on boot-up and in Telewriter-64*? I have a gray-case color computer, ADOS Version 1.01. video output board I built from Tim McIntosh's article in* RAINBOW *(September 1986), and a Magnavox 80 computer monitor. I am considering changing to the MC6847-T1 VDG (*RAINBOW *October, November and December 1986). Will this chip change solve my problems, or is there an easier method?*

David Gierhart
Fremont, OH

℞ With the CoCo 3, you have control over the palettes and can therefore get any color combination you want in any mode. With the earlier CoCos, the color combinations are hard-wired. Howard Cohen wisely designed *Telewriter-64* to use dark text on a light background to maximize readability. Light text on a dark background using a `PMODE4` screen with *Telewriter-64* will result in a less legible display. The MC6847-T1 would give you true lowercase in the 32-by-16 display, but it makes little sense spending money to enhance the display of an older CoCo when, with a few more dollars, you can move up to a CoCo 3 and get a real 80-by-24 display with your Magnavox 80 computer monitor.

Erasing the Errors

I have a 64K CoCo 2 with an FD-501 disk drive. When I try to load a machine language or BASIC *program I get an FD Error. When I try it several times it works. When I list a program and use the* SHIFT @ *command, I am sometimes given a TM Error. It also does other strange things at times. Any suggestions?*

Jeff Warren
Maymesville, NC

℞ Try cleaning the contacts on your disk controller where it connects to the ROM pack port. A rubber eraser will remove the black oxidation (the root of the problem) and restore the silvery finish and electrical continuity.

Richard Esposito is the principal engineer for BDM Corporation. He holds bachelor's, master's and doctorate degrees from Polytechnic Institute of Brooklyn. He has been writing about microcomputers since 1980.

Richard Libra is a simulator test operator for Singer Link Simulation Systems Division.

Seeing Both Sides

What is the best way to access both sides of a double-sided drive on the CoCo 3 other than using ADOS?

Steve Morrison
(STEVENM)
Newton, NC

℞ The drive selections in Disk Color BASIC are controlled by four addresses corresponding to the four possible drives allowable in Disk Extended Color BASIC (DECB):

	DECB1.1	DECB1.0
#0	55453	55210
#1	55454	55211
#2	55455	55212
#3	55456	55213

Normally, the addresses corresponding to slots #0 through #3 contain the values 1, 2, 4 and 32, respectively, but you can change these on the CoCo 3 since these values are in RAM. If, for example, you poke Slot #0 with 2 and Slot #1 with 1, your Drive 0 will act like a Drive 1 and your Drive 1 will act like a Drive 0. In a double-sided system, you cannot have more than three drives, since, with these, Slot #3 is used for side selection. So, if you want #2 to be the back of Drive 0, poke #2 with 33 (32+1); and if you want #3 to be the back of #1, poke #3 with 34 (32+2).

Missing Voltage

I have a CoCo 2 and a CoCo 3 and two FD-500 drives. Also, I am using a 26-3124 Multi-Pak interface. I have installed the upgrade board in the MPI as outlined by Marty Goodman in the January 1987 issue of RAINBOW. Everything works fine as long as the FD 500 disk controller is plugged into the MPI. But when I plug the disk controller directly into the CoCo 2 or the CoCo 3 ROM port, I get nothing but garbage. The screen either becomes black or shows a vertical pattern of colored @s. Can you help me?

Chris Voelker
Banning, CA

℞ The original disk controller was made for the CoCo 1, which supplied 12 volts at the ROM pack port. The newer CoCo 2 and CoCo 3 require either a Multi-Pak, which supplies the missing voltage, or a newer 5 volt-only controller.

Double-Precision

Willard Conner, in your March 1987 column, wrote in wanting to be able to use double-precision arithmetic. Radio Shack has a book called TR-S80 Color Computer Programs, *in which there is a program using that feature. I was able to use it, but never fully understood it. Maybe it will help him, however.*

Harold Hendricson
McAllen, TX

℞ Thanks for the info.

Tracking TCE

I have just read your September 1987 column and was interested in your reference to TCE Systems. Unfortunately, I am not one of those who use Delphi, and I would appreciate it if you would let me know the address of TCE Systems.

Karl Casper
Professor of Physics
Cleveland, OH

℞ All I have on TCE is two phone numbers: (800) 4TC-4TCE and (301) 963-3848. Their last advertisement in THE RAINBOW was in the February 1987 issue. KENSHUNK is no longer on Delphi.

ROM Pack Patches

I have a CoCo 3 and an FD-502 disk drive. Recently I backed up my ROM packs to disk using David Dawson's "Pak to Disk Transfer" in the December 1987 issue of RAINBOW. It worked great until I tried it on a newer ROM pack from Radio Shack. It seemed to save and load properly, but when I typed `EXEC` *the computer locked up, flashing streaks on the screen, and could not be terminated by pressing reset. What is the exact memory location for a ROM pack in a CoCo 3? The disk manual is not too clear in this area. Is there a poke I should use before* `EXEC`*, or is there something wrong with this patch?*

Dale Szabo
Prince Albert, Saskatchewan

℞ Patches for some of the newer ROM packs to be used with Dawson's program appeared in the March '88 installment of this column. If anyone can add to this list, write to me and I'll include your additional patches along with your name in a future issue.

MikeyTerm to the Rescue

I own a DCM Modem Pack Version 1.00.00 with the built-in terminal program. I was wondering if there was any way I could use a different terminal program with it. I would also like to know if there is any way I can add a bigger buffer in the DMP-105 printer. Is there any program available for the Color Computer that changes Commodore programs to the CoCo and vice versa?

Lucas Korytkowski
Toronto, Ontario

℞ The public domain program *MikeyTerm*, available for $10 from Mike Ward, 1807 Cortez, Coral Gables, FL 33134, is configurable to work with your DCM Modem Pack. External printer buffers that hook between your computer and printer are commercially available. With the proper software, you can allocate otherwise unused RAM in a 64K plus CoCo 1, 2 or 3 for a print buffer.

Double-Sided Disk Directories

Is there a way to use DIR Alpha *and* DIR Print *(February '88 issue, Page 80) to access and print the directories of my double-sided disks? My system consists of the following: CoCo 2 with 64K Extended BASIC, one double-sided drive with HDS controller and an Epson LX-800 dot matrix printer. Both of the programs work great, but only for Side 0 of the drive. My system is set up for 0 and 2 (0 is the default). I access Side 2 of the disk by typing in* `LOADM"filename:@`. *The DOS I'm using is OwlDOS Custom Modified Version 1.1 ©1982 Tandy Lic. by Microsoft.*

Joaquin Chea
New Market, AL

℞ If the `DRIVE` command is implemented, set your OwlDOS to access the back side of the disk and then run the program. Better yet, set up the programs as subroutines and make the `DRIVE` command part of the program.

For a quicker response, your questions may also be submitted through RAINBOW's CoCo SIG on Delphi. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type `ASK` for "Ask the Experts" to arrive at the EXPERTS> prompt, where you can select the "Doctor ASCII" online form which has complete instructions.

Training on correct comma usage

CoCo Uses Some Comma Sense!

By Fred B. Scerbo
Rainbow Contributing Editor

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget this is BASIC. All programs resulting from your wishes are for your use, but remain the property of the author.

Enough, OK? I've gotten your message. Several months ago I printed some corrections to make five older "Wishing Well" programs work more efficiently on the CoCo 3. Since then, I have been deluged with letters from readers telling me that to change the color set from blue to red on CoCo programs using artifact colors, I only needed to hold down the F1 key while pressing the reset button.

Mea culpa, mea culpa, mea maxima culpa! (Latin for saying, roughly, "Sorry, but I made a mistake. It's all my fault!") Remember, I am still relatively new to all the features on the CoCo 3. I have not had the chance to do all the reading that some of you have done since getting your new machines. My time on the CoCo has been spent in creating new programs for you.

In any case, thank you for pointing that out to me and keeping me on my toes. Still, having these programs corrected will solve the problem for those who did not know about the reset and F1 either. It is always nice to have a program run correctly the first time without having to go through any keyboard gymnastics.

Comma, Comma Down Doobie Do Down Down

(Sorry, but I couldn't resist the pun.) In any case, this month's "Wishing Well" program will help train users on the correct grammatical use of the comma. Correct usage of commas is a skill that many students have great difficulty mastering. Five general rules must be mastered in order to correctly use commas in English grammar. They are:

1) Use commas between items in a list.
2) Use commas when addressing someone in a sentence.
3) Use a comma to separate a quotation from the rest of the sentence.
4) Use a comma to set off the words "yes" or "no" in a sentence.
5) Use a comma before a conjunction to separate two complete ideas in a sentence.

Not every student can easily memorize these rules. They often become second nature only by repeated use. That's where the new program comes in.

Comma Sense

This new program is designed both to review the rules of comma use and to quiz the user on the correct placement of commas in a sentence. The program will work in 16K Color Extended BASIC. (Sorry, no Speech/Sound Pak for this one.)

The program as listed has 25 sample sentences covering all five rules. The sentences are stored in `DATA` statements and can be replaced by your own sentences if you want. I have even included a subroutine allowing you to have a sentence with quotation marks in it, which is often difficult to do when using either `DATA` statements or string variables. More on that later, though.

Running the Program

When you run the program, our title card will ask whether you want Instruction or Quiz. Pressing I will review the five rules for you and tell you how to use the program. Pressing Q will cause the program to go directly to the quiz. The instruction segment is self-explanatory.

In the quiz you will be given numbered sample sentences in random order. Each sentence will have all commas removed by the program. You must retype the sentence with the commas in the correct places. The program has the same routine as *Jumble* presented in the May '88 RAINBOW (Page 74). The cursor works much like a word processor in that words will not be split up at the edge of the screen. The backspace key will work to erase any errors made. Pressing ENTER finishes the input.

You must be careful about a few things. First, do not type too quickly or you will get ahead of the program. Secondly, be sure to put one space after every comma to match the original sentence in memory.

When you think you have the sentence typed in correctly, press ENTER. If the sentence is correct, you will be told so. If it is not, you will be given two more chances to correct it by backing up with the cursor to your mistake. After the third try you will be shown the error, and the correct sentence will be shown to you.

You may check your score at any time by pressing the @ key. You may return to the quiz by pressing C for continue.

Adding Your Own Sentences

It is actually quite simple to add your own sentences to the program. You may add up to 50 sentences to the program in `DATA` statements starting with Line 1000. To delete my information type `DEL 1000-4999` and press ENTER. This will ensure that the last line in the program will be `5000 DATA END`. If you accidentally kill this line, be sure to reenter it. To add your own information, simply type in a sentence with commas and wrap it in quotation marks: `1000 DATA "SAM, COME HERE."`

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

If you want to type a statement already using quotation marks, naturally you cannot put quotes in quotes. Therefore, whenever you wish to have quotation marks appear in the statement, use an asterisk (*) instead: `1010 DATA "*HELLO,* HE SAID."` The * takes the place of the quotation mark. The program will re-interpret the data before it is used and print an actual quotation mark on the screen. (The screen will show the message "Please stand by," while this is being done.)

Remember, you may only add up to 50 statements. You may make them as easy or as difficult as you like, depending on the needs of the student using the program. You may also want to include more than one usage of the comma in the same sentence.

Try it out. I think you will agree that the program accomplishes its goal quite nicely.

Special Thanks

Several months ago I put out a request for old, used Color Computers for use with our special needs students in the school system in which I teach. I am extremely grateful to those of you who have sent recorders, computers, cables, printers, disk drives, programs and, most of all, old CoCos. Our high school resource room is now at full capacity. Every student who needs to use a machine has one.

Therefore, I have started placing the extra machines we have received at the elementary level with our special needs students there. So far, I have set up three additional classrooms for handicapped students where no computers were allocated before. You cannot imagine how overjoyed the teachers are to receive these machines. The kids are thrilled, too.

Most people have requested their names not be listed here in the magazine. I will honor that request. If you have not yet received your thank-you note, you will shortly. Again, I thank you from the bottom of my heart for your generosity. Anyone else who may have an old CoCo collecting dust may still contact me at my home address or at my home phone, (413) 663-9648. Any donations made to a school system are tax-deductable, and our school system can supply a receipt for your tax purposes. ☐

40	137	340	157
80	5	425	206
150	29	510	197
190	209	1120	204
260	48	END	178

The listing: COMMAS

```
1 REM *************************
2 REM *      COMMA SENSE      *
4 REM *    BY FRED B.SCERBO   *
5 REM *     60 HARDING AVE.   *
6 REM * NORTH ADAMS,MA 01247 *
7 REM *  COPYRIGHT (C) 1988  *
8 REM *************************
9 CLEAR3000:CLS0:PRINTSTRING$(32
,188);STRING$(32,204);:FORI=1TO2
56:READA:PRINTCHR$(A+128);:NEXT
10 PRINTSTRING$(32,195);STRING$(
32,179);
15 DATA46,44,44,44,44,44,42,37,4
4,44,44,44,45,32,46,44,45,44,44,
42,37,44,44,46,44,45,32,46,44,44
,44,45
20 DATA42,,,,32,32,37,,,,32,37,
,42,,32,,32,42,37,,32,32,32,37,3
2,46,44,44,44,45
25 DATA43,35,35,35,35,35,42,37,3
5,35,35,35,39,,42,,32,32,32,42,3
7,,32,32,,37,,42,,,64,37
30 DATA115,115,115,115,115,,115,
115,115,115,115,,115,114,,,,113,
112,115,115,115,115,115,115,,115
,115,115,115,115,115
35 DATA122,,,,116,,122,,,,116,,1
22,125,114,,,117,,122,112,,,,116
,,122,112,,,,116
40 DATA123,115,115,115,115,,123,
115,115,114,,,122,112,125,114,,1
17,,122,,,,,,,123,115,115,114,,
45 DATA,,,,117,,122,112,,112,,,1
22,,112,125,114,117,,122,,,,,,,1
22,,,,
50 DATA123,115,115,115,119,112,1
23,115,115,115,119,112,122,,,,12
5,119,,123,115,115,115,115,119,1
12,123,115,115,115,115,119
55 PRINT@419,"       BY FRED B.SCE
RBO     ";
60 PRINT@453,"  COPYRIGHT (C) 19
88  ";
65 PRINT@483," <I>NSTRUCTIONS OR
 <Q>UIZ ";
70 X$=INKEY$:XX=RND(-TIMER):IFX$
="I"THEN75ELSEIFX$="Q"THEN220ELS
E70
75 CLS:PRINT@34,"THIS PROGRAM IS
 DESIGNED TO      HELP YOU LEARN
THE CORRECT       USE OF THE 'COM
MA' IN A          COMPLETE SENTEN
CE.":PRINT@194,"YOU WILL BE GIVE
N A SENTENCE     WHICH HAS ALL TH
E COMMAS IN      IT REMOVED."
80 PRINT@322,"YOU MUST RE-TYPE T
HE SENTENCE     SO THAT IT IS CORR
ECT & MAKES     PROPER USE OF THE
COMMA."
85 PRINT@450,"PRESS <ENTER> TO C
ONTINUE.";
90 IFINKEY$<>CHR$(13)THEN90
95 CLS:PRINT@34,"OUR FIRST RULE
WHEN USING        COMMAS REQUIRES
 THAT WE USE      COMMAS BETWEEN
THINGS IN A       LIST."
100 PRINT@194,"HERE IS A SAMPLE
SENTENCE.":PRINT@258,"THE THREE
STOOGES ARE LARRY,    MOE, AND C
URLEY."
105 PRINT@354,"WE WOULD PAUSE AF
TER EACH          COMMA WHILE READI
NG ALOUD."
```

```
110 GOSUB115:GOTO130
115 PRINT@450,"PRESS <ENTER> TO
CONTINUE.";
120 IFINKEY$<>CHR$(13)THEN120
125 RETURN
130 CLS:PRINT@34,"OUR SECOND RUL
E WHEN USING      COMMAS REQUIRE
S THAT WE USE     COMMAS WHEN WE
 ARE CALLING      SOMEONE'S NAME
."
135 PRINT@194,"HERE IS A SAMPLE
SENTENCE.":PRINT@258,"JIM, COME
HERE SO I CAN SPEAK   WITH YOU."
140 PRINT@354,"WE WOULD PAUSE AF
TER THE        COMMA WHILE READI
NG ALOUD."
145 GOSUB115
150 CLS:PRINT@34,"OUR THIRD RULE
 WHEN USING       COMMAS REQUIRE
S THAT WE USE     COMMAS TO SEPA
RATE QUOTATIONS    FROM THE REST
OF A SENTENCE."
155 PRINT@194,"HERE IS A SAMPLE
SENTENCE.":PRINT@258,CHR$(34)"GO
 ANSWER THE DOOR,"CHR$(34)" HE":
PRINT"  SAID AS HE ENTERED THE R
OOM."
160 PRINT@354,"QUESTION MARKS OR
 EXCLAMATION   POINTS MAY BE USE
D ALSO."
165 GOSUB115
170 CLS:PRINT@34,"OUR FOURTH RUL
E WHEN USING      COMMAS REQUIRE
S THAT WE USE     COMMAS TO SET
OFF THE WORDS     YES OR NO."
175 PRINT@194,"HERE IS A SAMPLE
SENTENCE.":PRINT@258,"NO, YOU MA
Y NOT HAVE SOME ICE   CREAM BEFO
RE SUPPER."
180 PRINT@354,"WE AGAIN WOULD PA
USE AFTER      THE COMMA WHILE R
EADING ALOUD."
185 GOSUB115
190 CLS:PRINT@34,"OUR FINAL RULE
 SAYS THAT WE     MUST USE A COM
MA TO PAUSE IN    THE MIDDLE OF
A SENTENCE        BEFORE A CONJU
NCTION."
195 PRINT@194,"HERE IS A SAMPLE
SENTENCE.":PRINT@258,"WE WENT TO
 THE SUPERMARKET,     BUT IT WAS
 NOT OPEN."
200 PRINT@354,"THIS IS USED WHEN
 WE HAVE TWO    DIFFERENT THINGS
STATED."
205 GOSUB115
210 CLS:PRINT@34,"IF YOU DO NOT
GET THE CORRECT   ANSWER, YOU WI
LL BE GIVEN A     CHANCE TO TRY
IT AGAIN. YOU     MAY CHECK THE
SCORECARD BY      PRESSING THE <
@> KEY. YOU MAY   THEN RETURN TO
 THE PROGRAM BY   PRESSING <C> T
O CONTINUE"
215 PRINT@290,"WHEN TYPING YOUR
ANSWER BE      SURE TO PUT A SPA
CE AFTER A     COMMA. BE SURE TO
 TYPE SLOWLY!":GOSUB115
220 CLS0
225 DIMAO(51),A$(51),B$(51),NP(5
1)
230 CLS0:GOTO265
235 D=0
240 IFLEN(J$)<=27THEN255
245 FORT=27TO0STEP-1:IFMID$(J$,T
,1)=" "THEN260
250 NEXT
255 W$=J$+C$:F=LEN(W$):PRINT@M+D
,W$;STRING$(X-F,32):RETURN
260 W$=LEFT$(J$,T):C$="":W$=W$+C
$:F=LEN(W$):PRINT@M+D,W$;STRING$
(X-F,32):C$=D$:J$=S$+RIGHT$(J$,(
LEN(J$))-T):D=D+32:GOTO240
265 FORJ=1TO50:READ A$(J):IFA$(J
)="END"THEN275
270 NEXTJ
275 CLS0:J=J-1
280 FORI=1TOJ
285 AO(I)=RND(J)
290 IFNP(AO(I))=1THEN 285
295 NP(AO(I))=1:NEXTI
300 FORP=1TOJ:KL=0
305 CLS:PRINT@232,"PLEASE STAND
BY":A$="":B$="":R$="":C$="":D$="
":S$="    "
310 Q$=A$(AO(P)):K=LEN(Q$)
315 A$="":FORI=1TOK:L$=MID$(Q$,I
,1):IFL$="*"THEN A$=A$+CHR$(34)E
LSE A$=A$+L$
320 NEXTI:Q$=A$:A$=""
325 FORN=1TOK:IFMID$(Q$,N,1)=","
THEN335
330 A$=A$+MID$(Q$,N,1)
335 NEXTN:B$=A$:GOTO360
340 K=LEN(Q$):B$=LEFT$(A$,3):FOR
N=4TOK
345 R=RND(12):IFR>4THEN355
350 B$=B$+" "
355 B$=B$+MID$(A$,N,1):NEXTN
360 CLS:PRINT@35,"ADD COMMAS TO
EXAMPLE #";P:M=96::J$="     "+B$:X
=31:GOSUB235
365 M=289:PRINT@289,"=>"+CHR$(12
8);
370 X=29:C$=CHR$(128):D$=CHR$(12
8):S$="  "
375 Y$=INKEY$:IFY$="@"THEN460ELS
EIFY$=CHR$(13)THEN395ELSEIFY$=CH
R$(8)THEN385ELSEIFY$=""THEN375
380 R$=R$+Y$:J$="  "+R$:PRINT@29
1,"";:GOSUB235:PRINT:GOTO375
385 IFLEN(R$)<1THEN375
390 M=289:L=LEN(R$):R$=LEFT$(R$,
L-1):PRINT@M,"";:J$="  "+R$:GOSU
B235:PRINT:GOTO375
395 IFR$=Q$THEN400ELSE410
```

```
400 PRINT@480,"  YOU ARE ABSOLUT
ELY CORRECT!! ";
405 CR=CR+1:GOTO450
410 PRINT@480,"  SORRY, THAT IS
NOT CORRECT !";
415 IR=IR+1:KL=KL+1:IF KL<3 THEN
440
420 X$=INKEY$:IFX$<>CHR$(13)THEN
420
425 CLS:PRINT@64,"  THE CORRECT
USE OF THE COMMA    IN THIS SENT
ENCE IS:"
430 PRINT:J$="  "+Q$:D$="":C$=""
:X=31:M=192:GOSUB235
435 PRINT@416,"  PRESS <ENTER> T
O CONTINUE.";:GOTO450
440 X$=INKEY$:IFX$=CHR$(13)THEN4
45ELSEIFX$="@"THEN460ELSE440
445 PRINT@480,STRING$(30,32);:GO
TO375
450 X$=INKEY$:IFX$=CHR$(13)THEN4
55ELSEIFX$="@"THEN460ELSE450
455 NEXTP
460 CLS:PRINT@128,"";
465 L=CR+IR:IF L=0 THEN L=1
470 PRINT"    NUMBER CORRECT = "
CR
475 PRINT
480 PRINT"    NUMBER WRONG   = "
IR
485 PRINT:PRINT"    STUDENT SCOR
E  = ";INT(CR*100/L);"%"
490 PRINT:PRINT"    ANOTHER TRY
(Y/N/C)";
495 W$=INKEY$:IFW$=""THEN495
500 IF W$="Y" THEN RUN
505 IF W$="N" THEN CLS:END
510 IF W$="C" AND P<=J THEN 305
ELSE RUN
515 GOTO495
990 REM ENTER DATA AT LINE 1000
1000 DATA "TODAY WE BOUGHT SOME
SOUP, NUTS, GRAPES, AND BERRIES.
"
1010 DATA "SHE SAID IN A LOUD VO
ICE, *YOU'LL NEED MORE MONEY.*"
1020 DATA "YES, WE HAVE NO BANAN
AS."
1030 DATA "SAM, WHAT IS YOUR NEW
 ALBUM CALLED?"
1040 DATA "WE ORDERED THE NEW ED
ITION OF THE BOOK, BUT IT DID NO
T ARRIVE IN TIME."
1050 DATA "YES, YOU CAN COME ALO
NG IF YOU HAVE ENOUGH MONEY."
1060 DATA "IT SNOWED ALL SUNDAY
NIGHT, SO WE DID NOT HAVE SCHOOL
 ON MONDAY."
1070 DATA "I'LL HAVE THE BACON,
LETTUCE, AND TOMATO ON RYE."
1080 DATA "TAKE OFF THAT FOOLISH
 HAT, HARRY."
1090 DATA "*WE FIND HIM GUILTY A
S CHARGED,* THE FOREMAN OF THE
URY SAID."
1100 DATA "WE WENT TO THE LAW
RM OF DEWEY, CHEETUM, AND HOWE."
1110 DATA "SURE, YOU CAN COME BY
 ANYTIME YOU WANT."
1120 DATA "IT IS A NICE DAY, BUT
 I THINK IT IS GOING TO RAIN LAT
ER."
1130 DATA "DID YOU HEAR WHAT I S
AID, NORMAN?"
1140 DATA "YOU WILL NEED A COLOR
 COMPUTER, A DISK DRIVE, A MOUSE
, AND A PRINTER."
1150 DATA "I HAVE READ OTHER MAG
AZINES, BUT THE RAINBOW IS THE B
EST."
1160 DATA "*YOU WILL NEVER GET A
WAY WITH IT,* WARNED THE HOSTAGE
."
1170 DATA "ALICE, GET ME THE FLO
UR, SUGAR, CAKE MIX, AND MILK."
1180 DATA "NO, I DO NOT HAVE ANY
 MONEY TO LOAN YOU."
1190 DATA "HE DID NOT GET ALONG
WITH OTHERS, SO HE WENT HOME."
1200 DATA "WE TOOK SALLY, DEBBIE
, HARRY, AND JIM TO THE MOVIES."
1210 DATA "CERTAINLY, YOU CAN CO
ME IN NOW."
1220 DATA "DIDN'T YOU PAY ATTENT
ION TO ME, LARRY?"
1230 DATA "*THIS IS THE WORST DA
Y OF MY LIFE,* SCOTT SAID."
1240 DATA "HE HAD A FEW DRINKS,
BUT HE DID NOT DRIVE HIS CAR."
5000 DATA END
```

CORRECTIONS

"Ye Olde Font" (May 1988, Page 37): Bill Bernico has written to correct an error in his *English Print Font* program. The mistake isn't noticeable unless you print a whole string of 5s on the screen. Currently, Line 280, which defines the character 5, ends with `BU10BR10`. This line should end with `BU11BR10`.

"Received and Certified" (May 1988, Page 140): The price and contact phone number are incorrect for the listing of *ReMusic* 1.0. Codis Enterprises can be reached at (817) 283-8571. *ReMusic* 1.0 sells for $25, not $12.

For quicker reference, Corrections will be posted on Delphi as soon as they are available in the Info on Rainbow topic area of the database. Just type `DATA` at the CoCo SIG> prompt and `INFO` at the TOPIC> prompt.

Barden's Buffer

32K Disk

Can the CoCo Learn?

By William Barden, Jr.
Rainbow Contributing Editor

Can a computer possibly learn? For example, is it possible for your CoCo to learn how to play tic-tac-toe without your programming the winning strategies? Imagine this scenario: You start playing tic-tac-toe with your computer, and it loses at first. However, as it plays, it learns from past mistakes and plays better and better. Finally, it becomes a master tic-tac-toe player, able to beat you in almost every game. In this column we'll look at that question and actually make your CoCo into a learning machine! I'll even ask for your help in playing against the CoCo — but more on that later.

MENACE — A Matchbox Learning Machine

To give credit where credit is due, this whole concept comes from a description of MENACE, a Matchbox Educable Naughts and Crosses Engine, described in Martin Gardner's book *The Unexpected Hanging*. Gardner, the Puzzle Master of *Scientific American* for many years, describes a learning machine made out of 300 matchboxes by Donald Michie, a biologist at the University of Edinburgh.

Michie's matchboxes have a copy of a tic-tac-toe position on their cover (tic-tac-toe is called "naughts and crosses" in Great Britain). See Figure 1. Inside each matchbox are beads of different colors, each bead representing a move. There's a hole in each matchbox so that one bead can be randomly selected from all beads. The color of the bead selected determines the move.

The machine starts first and makes the first move (in fact this is done by someone shaking the matchbox with the "empty" tic-tac-toe matrix on the cover and noting the color of the bead). This matchbox is then left open to indicate that a move of that configuration has taken place.

For each machine move, a human opponent also makes a move. Since the machine started first, it plays odd moves — 1, 3, 5, 7 and 9. This means that any time the machine plays, there is an equal number of X's and O's on the tic-tac-toe matrix.

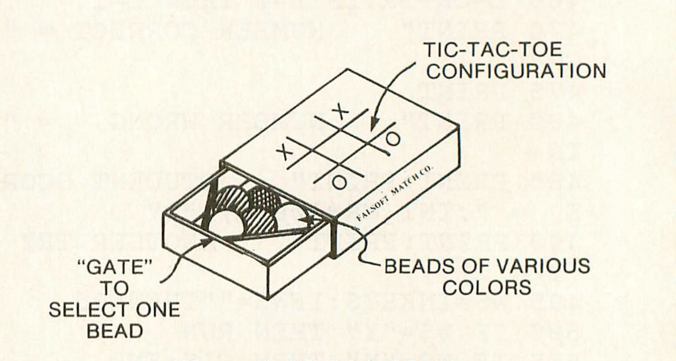

Figure 1: Michie's Matches

At the end of the game there are several open matchboxes representing the moves that occurred. Each open matchbox has a selected color bead that determined the next move. If the machine won the game, more beads of that color are added to each open matchbox. If the game was a draw, only one bead of that color is added to the matchboxes. If the machine lost the game, one bead of that color is taken from each matchbox.

Over many games, the matchboxes accumulate more beads representing winning moves than non-winning moves. The chance of selecting a winning bead (move) is much greater than that of selecting a losing or drawing bead. Gradually, the machine becomes smarter and smarter.

Tic-Tac-Toe Positions

The tic-tac-toe matrix looks like Figure 2. We'll assign each square a number of 1 through 9, as shown in the figure. For each of the nine squares, there are three possible characters that can be placed into the square — a blank (no move yet made), an O or an X. Instead of a blank, we'll use a dash character, just because it's easier to find the position on a printout.

Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years' experience in the industry covers a wide background: programming, systems analysis and managing projects for computers ranging from mainframes to micros.

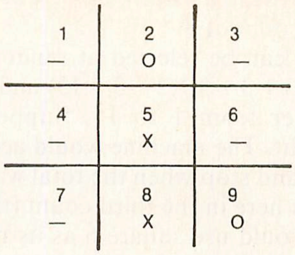

Figure 2: Tic-Tac-Toe Matrix Characters and Numbering

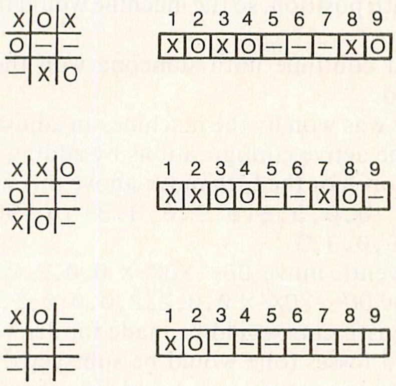

Figure 3: Tic-Tac-Toe String Representation

To make the tic-tac-toe matrix easier to print and process, we'll use a nine-character string, as shown in Figure 3. The character positions of the string are numbered from 1 through 9 and correspond to the tic-tac-toe positions. Several tic-tac-toe configurations are shown, with their corresponding string printouts.

How many different configurations of the tic-tac-toe matrix are there? We can compute that fairly easily on the CoCo. We'll start with no entries, a string of `---------`. Then we'll increment by one from the left, changing a dash to an O: `--------O`. The next increment will change an O to an X: `--------X`. The next increment will change an X to a dash again and add one to the next lower position: `-------O-`. We'll stop when we get to `XXXXXXXXX`. The program to do this is shown in Listing 1, and the first few strings are:

```
--------- 1
--------O 2
--------X 3
-------O- 4
-------OO 5
-------OX 6
-------X- 7
-------XO 8
-------XX 9
------O-- 10
------O-O 11
```

Do you see any pattern here? If a dash stands for an O, an O for a 1, and an X for a 2, we can construct a ternary number of base three out of the patterns. The pattern `-X-O--XXO` becomes `020100221`. A ternary number is similar to a binary number but uses the digits 0, 1 and 2. In fact there are three to the ninth configurations of tic-tac-toe patterns, or 19,683 patterns. The program in Listing 1 will list them all.

Some of the patterns, though, just can't be. The pattern `OOO------` consists of three moves of O's and no others. Someone's cheating. Likewise, `000111111` has six X's and three O's, an unequal number of moves and impossible.

The program shown in Listing 2 lists all possible moves that the machine can make if it goes first. Remember that if the machine goes first it is always confronted with a tic-tac-toe configuration with an equal number of X's and O's. We'll use O for the machine's move, by the way.

It turns out that there are 3,139 possible configurations with an equal number of X's and O's. The last four are:

```
XXXXO-OOO 19535
XXXXOO-OO 19553
XXXXOOO-O 19559
XXXXOOOO- 19561
```

Note that each configuration has a corresponding number based on the original 19,683 configurations. Since most of the 19,683 configurations are not possible, there are gaps in the numbering.

Michie originally used about 300 matchboxes in his manual method of MENACE. That's cheating somewhat. He reasoned that the configurations in Figure 4 were all the same, if the tic-tac-toe matrix was rotated and the mirror image was considered. We'll use the brute force method here and consider all possible configurations without regard to rotations or mirror images.

Possible Next Moves

For each configuration, there are one to nine possible next moves. The `---------` configuration, for example, repre-

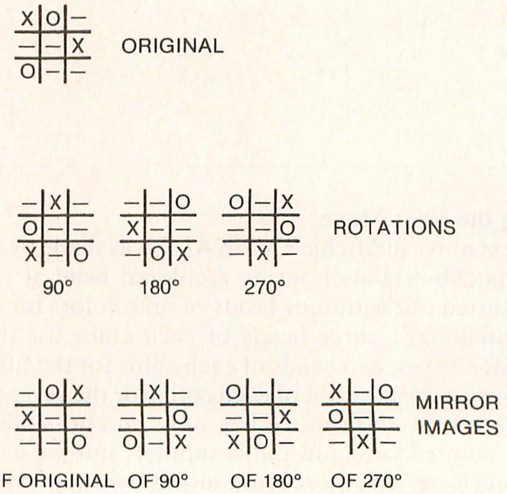

Figure 4: Rotations and Mirror Images

sents a game where no one has moved. The machine can play an O in any of the nine squares:

```
O--------
-O-------
--O------
---O-----
----O----
-----O---
------O--
-------O-
--------O
```

The `O-------X` configuration represents a machine's first move in the upper left-hand corner and the human's response with an X in the lower right-hand corner. The machine can now play in any of seven positions:

```
OO------X
O-O-----X
O--O----X
O---O---X
O----O--X
O-----O-X
O------OX
```

The `OO-----XX` configuration represents two moves by the machine and two matching moves by the human. The machine can now play in any of the five remaining positions.

The `OO-O-X-XX` configuration represents three moves by the machine and three matching moves by the human. The machine can now play in any of the three remaining positions.

The `OOOO-XXXX` configuration represents four moves by the machine and four matching moves by the human. The machine can now play in one remaining position.

From these examples, you can see the relationship between the move number, the number of X's and O's already played, and the number of positions in which the machine can play:

Move	# of O's (machine)	# of X's (human)	Remaining positions
1	0	0	9
3	1	1	7
5	2	2	5
7	3	3	3
9	4	4	1

Selecting the Next Move

The next move in Michie's MENACE was made by shaking up the matchbox and choosing a colored bead at random. Michie started out with four beads of nine colors for the first move matchboxes, three beads of each color for the third move matchboxes, two beads of each color for the fifth move matchboxes, and one bead of each color for the seventh move matchboxes (the ninth move has only one possibility). We can't use colored beads in the computer, but we can use a byte for each possible position and put a count in the byte. We'll use counts of five, four, three, two and one to simplify the ninth move processing. The count represents the number of colored beads. As an example, the configuration `OO--X-X--` is a fifth move configuration with five possible next moves by the machine. We'll put three beads in our figurative matchbox for each of the five possible moves: `OO--X-X-- 0,0,3,3,0,3,0,3,3`.

The impossible moves (those already occupied by an X or O) are initialized with a count of 0. Possible moves are initialized with a count of 3.

The next move can be selected at random by adding up all of the counts (3 + 3 + 3 + 3 + 3 = 15) and then generating a random number from 1 to 15. Suppose the number generated was eight. The machine would accumulate counts from left to right and stop when the total was equal to eight. Since eight occurs here in the third count (tic-tac-toe square 6), the machine would use square 6 as its next move: `OO--XOX--`. The human might reply with square 9: `OO--XOX-X`.

At this point we're into a seventh move configuration of `OO-XOX-X`. The machine would look at that configuration, which was initialized to two counts for each position: `OO-XOX-X 0,0,2,2,0,0,0,2,0`.

The machine would add up the counts (2 + 2 + 2 = 6) and select a random number between 1 and 6, say 5. The number 5 is in the eighth position, so the machine would respond with: `OO--XOXOX`.

Play would continue until someone won the game or a draw occurred.

If the game was won by the machine, an adjustment would be made to the active configurations by adding three counts to each position. For the fifth move above this would change `OO--X-X-- 0,0,3,3,0,3,0,3,3` to `OO--XX-X-- 0,0,3,3,0,6,0,3,3`.

For the seventh move `OO--XOX-X 0,0,2,2,0,0,0,2,0` would become `OO--XOX-X 0,0,2,2,0,0,0,5,0`.

Similar adjustments would be made for draws (one would be added) and losses (one would be subtracted). The whole process would emulate "reward and punishment" used for training pets (and unruly kids) and should make the machine choose the path with the most counts.

Recording the Counts

We need a character string of nine bytes (characters) to record the configuration and nine additional bytes to hold counts — a total of 18 bytes. Since there are 3,139 possible

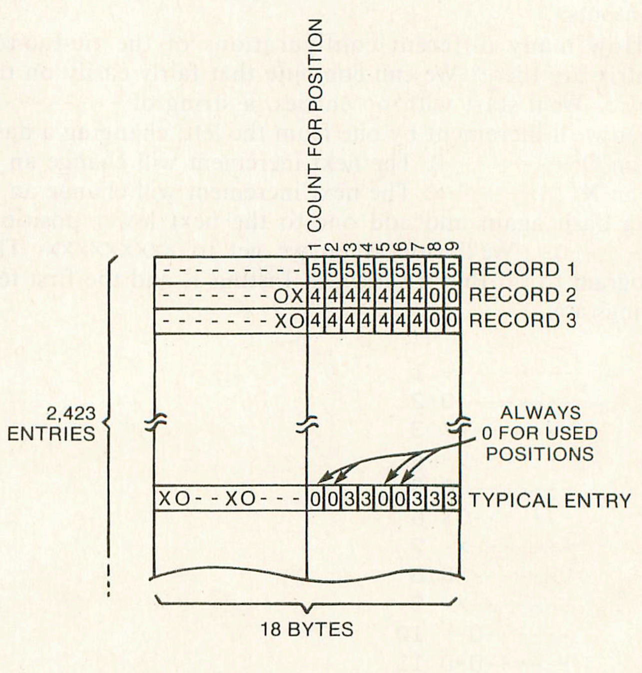

Figure 5: `TICTACTO.DAT` **File Format**

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configurations, that's 3,139*18 = 56,502 bytes, too large for normal BASIC memory. One solution is to hold configuration and counts in a disk file.

Since we're holding binary data in the counts (counts may range from 0 to 255) the file should be a *random* file. Sequential files are somewhat sensitive to odd values in bytes, such as values less than 32. Random files allow us to hold any value without problems.

The random file we'll use looks like Figure 5. Each record in the file has 18 bytes. The first nine bytes hold the configuration, a string of dashes, O's, and X's. The next nine bytes are nine fields, each field containing a count of 0 through 255. The file is generated by the program in Listing 3, a variation of the program in Listing 2. The new program initializes the master tic-tac-toe file and is used only once.

The program in Listing 3 also eliminates "end game" conditions, such as:

```
X X X
- O -
O - O
```

These end game conditions are not valid configurations because they would be detected before the machine had to make the next move. There are 18 end game conditions, three rows filled, three columns filled, and two diagonals filled for either O's (machine) or X's (human). Eliminating the end game configurations brings the total number of configurations down to 2,423 and the file of configurations down to 43,614 bytes.

The `TICTACTO.DAT` file is used by the processing program (described shortly) to find the current tic-tac-toe configuration and to look at the possible responses the machine can make. The program in Listing 3 also generates another file, called `TTTDIR.DAT`. This file is a sequential file, as shown in Figure 6. `TTTDIR.DAT` lists the record number in the `TICTACTO.DAT` file for any tic-tac-toe configuration. The catch is that a tic-tac-toe configuration such as `-X--O-X-O` must first be converted to a ternary number (in this example 4,474).

The `TTTDIR.DAT` file is read into memory and scanned to find the current tic-tac-toe configuration; the index of the `TTTDIR.DAT` entry (how far down the directory the entry is located) is identical to the number of the record in the `TICTACTO.DAT` file.

After running the program of Listing 3, therefore, you'll have two files on disk: the `TICTACTO.DAT` main working file, and the `TTTDIR.DAT` directory file. Both are used by the `TICTACTO.BAS` program.

The TICTACTO.BAS Program

This program draws the tic-tac-toe diagram, checks for an end condition, and "rewards" or "punishes" the tic-tac-toe data so that the program learns. The program contains no intelligence to make it smart — it just accumulates data for the learning process. The program is shown in Listing 4.

Reading in the TTDIR.DAT File

The first thing the program does is to read in the `TTTDIR.DAT` file into Array D. This file contains all 2,423 possible configurations of the tic-tac-toe matrix, in base 3 representation to save space. The program scans this array to find the current configuration and then uses the index value (1 through 2,423) as the record number of the `TICTACTO.DAT` record containing the counts and valid moves for the machine to make. Reading in the `TTTDIR.DAT` file takes a minute or so but only has to be done once for any number of games you want to play.

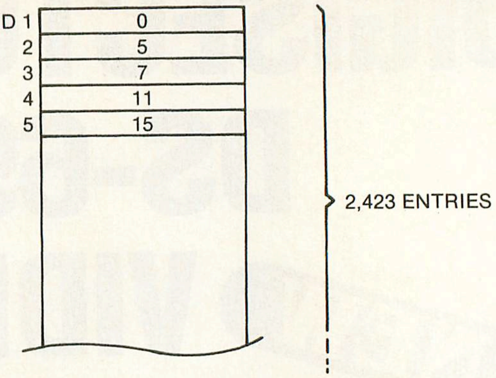

Figure 6: `TTTDIR.DAT` **File Format**

Screen Display

The screen display for `TICTACTO.BAS` is not very elegant. It is designed to run on 32-character wide text displays and looks like this:

```
    1 2 3
    4 5 6
    7 8 9
    - - -
    O - -
    - - -
YOUR MOVE: ?
```

General Operation

Note that as soon as the program starts running, the machine makes the first move. For every move made, the program looks at the current configuration, converts it to a base number, looks up the number in the D array, and then uses the index of the D array entry to read in the record from the `TICTACTO.DAT` file.

Once the record is read in, the counts are totaled. A random number is then generated, and a selection of the position is made to determine where the machine will play an O. The machine then makes the play.

After the machine has played, a test for done is made. This checks the rows, columns and diagonals for a machine win or a draw. The human cannot win at this point because the last human move was checked for a done condition directly after the move. By the way, draws can only occur after the machine has played.

If the machine has not won, a prompt message for the human's move is displayed. The human can play in any blank square; a check is made for a valid square. After the play has been made, a check for done is performed. If the human has not won, a loop is made back to the machine's play.

Reward and Punishment

Each time the machine plays, a record is made of the `TICTACTO.DAT` entry number and the position in which the response was made. (This corresponds to opening the box in Michie's MENACE.) At the end of the game, each `TICTACTO.DAT` entry is adjusted by adding or subtracting counts from the entry position. Three is added for a win, one is added for a draw, and one is subtracted for a loss. The updated entries for `TICTACTO.DAT` are written back out to disk, so that the `TICTACTO.DAT` always reflects the accumulated knowledge of the machine.

A history file is also updated at the end of the game. This file is another random file with records one byte long. For each game, a new letter is added to the end of the file — either W, D or L.

Variables

As mentioned above, D holds the base 3 configurations. It's a numeric array of 2,423 entries and takes up about 12,115 bytes.

Arrays R and F hold the record number and position number for play for each machine move. These arrays are used to update the `TICTACTO.DAT` file after each game. Array `A$` is the actual tic-tac-toe matrix itself. Each of its nine entries corresponds to one of the nine tic-tac-toe positions. Each entry holds either a dash, X or O. Array BD is the numeric form of the array. It's used to make the conversion from a string configuration to a base three numeric configuration easier.

Subroutines

The program is divided into subroutines to make the processing more modular and easier to decode.

The Display O or X subroutine uses the variable `I` to indicate the position on the tic-tac-toe matrix of 1 through 9. The tic-tac-toe matrix uses three lines starting at screen positions 207, 239, and 271. One blank is used between positions. The one character in string variable `Y$` (O or X) is printed at the line start plus a displacement based upon the the position number.

The Test for Done subroutine builds up a string called `X$`, composed of the three characters from an `A$` row, column, or diagonal. Another subroutine is then called to test for either an `XXX` or `OOO` string. The main subroutine also tests for all positions filled. If a draw results (nine positions filled), the variable `DN` is set to 1. If the machine has won, `DN` is set to 3; if the human has won, `DN` is set to -1. If there is no done condition, `DN` is set to 0. Note that `DN` holds the reward or punishment count to be added or subtracted from the count in the `TICTACTO.DAT` entries.

The next machine move subroutine first converts the tic-tac-toe configuration into a base 3 number. Array D is then searched for this number. The number *must* be found, as Array D holds all possible configurations. When found, the index to Array D is equivalent to the record number of the `TICTACTO.DAT` entry. A `GET` reads this record. A random selection is then made of the machine's play. The Display X subroutine is called to display the play, and the `A$` array is changed to reflect the play. An entry is also made in the R array for the record number and the F array for the position number of the play.

The reward/punishment subroutine looks at Array R to find each record of `TICTACTO.DAT` that has been used in the play. Each of these records is read in, and the count in the proper position (obtained from Array F) is adjusted by the value in the variable `DN`. The record is then rewritten to disk.

A single-character record is then added to the history file to reflect the results of the game.

How Would You Like to Be a Teacher?

With some slight modifications, it would be possible to make the program play against itself (just generate a random number of 1 through 9 in place of the user input). The machine would then go along and play continuous game after continuous game, presumably getting smarter all the time.

For the purposes of this column, though, I thought it might be interesting if interested readers would play the hundreds or thousands of games required to make the program learn. What I visualize is this:

Interested CoCo freaks can write me for a copy of the game and files. I will then send the game out in sequence so that each person can play as many games as he or she wishes — maybe a hundred or so each (about a half-hour's worth). The player can then send the updated disk back to me, and I'll send it on to the next person. After the machine learns how to play properly, I'll send a copy of the updated files back to each person, so he or she can see how smart the program has become. I'll also plot the learning statistics in a column, together with the names of each person who participated. For this project to work, we must send the master disk by at least first class mail. I visualize about a month's worth of time until we have a smart program. How about it? If you would like to participate in this experiment, send your name and address to me at:

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See you next month with more CoCo topics. ☐

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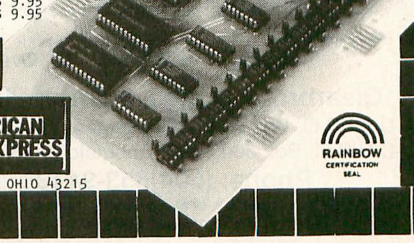

Listing 1: `ALLPERMS`

```
100 ' PRINTS ALL PERMUTATIONS OF
 TIC-TAC-TOE, EVEN IMPOSSIBLE ON
ES
110 DIM A$( 9 )
120 C = 0
130 FOR I = 1 TO 9: A$( I ) = "-
": NEXT
140 C = C + 1
150 FOR I = 1 TO 9: PRINT A$( I
);: NEXT: PRINT C
160 I = 9
170 IF A$( I ) = "-" THEN A$( I
) = "O": GOTO 180 ELSE IF A$( I
) = "O" THEN        A$( I ) = "X
": GOTO 180 ELSE A$( I ) = "-":
IF I <> 1 THEN I = I - 1: GOTO
     170 ELSE GOTO 190
180 GOTO 140
190 STOP
```

Listing 2: `1STMOVES`

```
100 ' PRINTS ALL POSSIBLE PERMUT
ATIONS OF TIC-TAC-TOE FOR MACHIN
E FIRST MOVE
110 DIM A$( 9 )
120 C = 0: PC = 0
130 FOR I = 1 TO 9: A$( I ) = "-
": NEXT
140 C = C + 1
150 BC = 0: OC = 0: XC = 0
160 FOR I = 1 TO 9: IF A$( I ) =
 "-" THEN BC = BC + 1 ELSE IF A$
( I ) = "O"         THEN OC = OC
 + 1 ELSE XC = XC + 1
170 NEXT
180 IF OC = XC THEN PRINT A$( 1
); A$( 2 ); A$( 3 ); A$( 4 ); A$
( 5 ); A$( 6 );      A$( 7 ); A$(
 8 ); A$( 9 ); C: PC = PC + 1
190 I = 9
200 IF A$( I ) = "-" THEN A$( I
) = "O": GOTO 210 ELSE IF A$( I
) = "O" THEN        A$( I ) = "X
": GOTO 210 ELSE A$( I ) = "-":
IF I <> 1 THEN I = I - 1: GOTO
     200 ELSE GOTO 220
210 GOTO 140
220 PRINT PC
```

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```
270 ......223
390 ......192
610 ........5
END ......87
```

Listing 3: DATAMAKR

```
100 ' INITIALIZES "TICTACTO" WOR
KING FILE FOR PLAY
110 CLS
120 PRINT "INITIALIZE TICTACTO"
130 OPEN "D", #1, "TICTACTO", 18
140 OPEN "O", #2, "TTTDIR"
150 FIELD #1, 9 AS X$, 1 AS B$,
1 AS C$, 1 AS D$, 1 AS E$, 1 AS
F$, 1 AS G$,          1 AS H$, 1 AS
 I$, 1 AS J$
160 DIM A$( 9 )
170 C = -1: PC = 1
180 FOR I = 1 TO 9: A$( I ) = "-
": NEXT
190 BC = 0: OC = 0: XC = 0
200 C = C + 1
210 FOR I = 1 TO 9: IF A$( I ) =
"-" THEN BC = BC + 1 ELSE IF A$
( I ) = "O"         THEN OC = OC
+ 1 ELSE XC = XC + 1
220 NEXT
230 IF OC <> XC THEN GOTO 450
240 IF OC < 3 THEN GOTO 260
250 GOSUB 530: IF DN <> 0 THEN G
OTO 450
260 IF OC = 0 THEN MN = 5 ELSE I
F OC = 1 THEN MN = 4 ELSE IF OC
= 2 THEN MN = 3       ELSE IF OC =
 3 THEN MN = 2 ELSE MN = 1
270 LSET B$ = CHR$( 0 ): LSET C$
 = CHR$( 0 ): LSET D$ = CHR$( 0
): LSET E$ =          CHR$( 0 ): L
SET F$ = CHR$( 0 ): LSET G$ = CH
R$( 0 ): LSET H$ = CHR$( 0 ):
   LSET I$ = CHR$( 0 ): LSET J$
 = CHR$( 0 )
280 FOR I = 1 TO 9
290 IF I = 1 THEN IF A$( 1 ) = "
-" THEN LSET B$ = CHR$( MN )
300 IF I = 2 THEN IF A$( 2 ) = "
-" THEN LSET C$ = CHR$( MN )
310 IF I = 3 THEN IF A$( 3 ) = "
-" THEN LSET D$ = CHR$( MN )
320 IF I = 4 THEN IF A$( 4 ) = "
-" THEN LSET E$ = CHR$( MN )
```

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```
330 IF I = 5 THEN IF A$( 5 ) = "
-" THEN LSET F$ = CHR$( MN )
340 IF I = 6 THEN IF A$( 6 ) = "
-" THEN LSET G$ = CHR$( MN )
350 IF I = 7 THEN IF A$( 7 ) = "
-" THEN LSET H$ = CHR$( MN )
360 IF I = 8 THEN IF A$( 8 ) = "
-" THEN LSET I$ = CHR$( MN )
370 IF I = 9 THEN IF A$( 9 ) = "
-" THEN LSET J$ = CHR$( MN )
380 NEXT I
390 Y$ = A$( 1 ) + A$( 2 ) + A$(
 3 ) + A$( 4 ) + A$( 5 ) + A$( 6
 ) + A$( 7 ) +          A$( 8 ) + A$
( 9 )
400 LSET X$ = Y$
410 PUT#1, PC
420 PRINT#2, C
430 PC = PC + 1
440 PRINT ".";
450 I = 9
460 IF A$( I ) = "-" THEN A$( I
) = "O": GOTO 470 ELSE IF A$( I
) = "O" THEN          A$( I ) = "X
": GOTO 470 ELSE A$( I ) = "-":
IF I <> 1 THEN I = I - 1: GOTO
   460 ELSE GOTO 480
470 GOTO 190
480 CLOSE
490 PRINT "TICTACTO INITIALIZED"
500 PRINT "COUNT="; PC - 1
510 END
520 '============================
================================
=======
530 ' TEST FOR DONE SUBROUTINE
540 CT = 0
550 FOR I = 1 TO 9
560 IF A$( I ) <> "-" THEN CT =
CT + 1
570 NEXT
580 IF CT = 9 THEN DN = 1: GOTO
740
590 Z$ = A$( 1 ) + A$( 2 ) + A$(
 3 ): GOSUB 760
600 IF DN <> 0 THEN GOTO 740
610 Z$ = A$( 4 ) + A$( 5 ) + A$(
 6 ): GOSUB 760
620 IF DN <> 0 THEN GOTO 740
630 Z$ = A$( 7 ) + A$( 8 ) + A$(
 9 ): GOSUB 760
640 IF DN <> 0 THEN GOTO 740
650 Z$ = A$( 1 ) + A$( 4 ) + A$(
 7 ): GOSUB 760
660 IF DN <> 0 THEN GOTO 740
670 Z$ = A$( 2 ) + A$( 5 ) + A$(
 8 ): GOSUB 760
680 IF DN <> 0 THEN GOTO 740
690 Z$ = A$( 3 ) + A$( 6 ) + A$(
 9 ): GOSUB 760
700 IF DN <> 0 THEN GOTO 740
710 Z$ = A$( 7 ) + A$( 5 ) + A$(
 3 ): GOSUB 760
720 IF DN <> 0 THEN GOTO 740
730 Z$ = A$( 1 ) + A$( 5 ) + A$(
 9 ): GOSUB 760
740 RETURN
750 '--------------------
760 ' EVALUATE
770 IF Z$ = "XXX" THEN DN = -1:
GOTO 800
780 IF Z$ = "OOO" THEN DN = 3: G
OTO 800
790 DN = 0
800 RETURN
```

```
310 .......23  1050 .....127
480 ......134  1220 ......39
680 .......77  END ......62
830 ......104
```

Listing 4: TICTACTO

```
100 ' TIC-TAC-TOE DRIVER PROGRAM
110 '============================
================================
=======
120 CLS
130 PRINT "READING DIRECTORY"
140 DIM D( 2423 ), R( 5 ), F( 5
), A$( 9 ), BD( 9 )
150 '--------------------
160 OPEN "I", #1, "TTTDIR.DAT"
170 FOR I = 1 TO 2423
180 INPUT#1, D( I )
190 PRINT ".";
200 NEXT I
210 CLOSE 1
220 CLS
230 PRINT "DIRECTORY IN MEMORY"
240 '--------------------
250 OPEN "D", #2, "TICTACTO.DAT"
,18
260 FIELD#2, 9 AS B$, 1 AS C$, 1
 AS D$, 1 AS E$, 1 AS F$, 1 AS G
$, 1 AS H$,          1 AS I$, 1 A
S J$, 1 AS K$
270 '============================
================================
=======
280 FOR I = 1 TO 300: NEXT
290 CLS
300 FOR I = 1 TO 9: A$( I ) = "-
": NEXT
310 FOR I = 1 TO 5: R( I ) = -1:
 NEXT
320 RP = 1: FP = 1
330 CLS
340 PRINT "                 1 2 3"
```

```
350 PRINT "               4 5 6"
360 PRINT "               7 8 9"
370 PRINT: PRINT
380 PRINT@ 207, A$( 1 ); " "; A$
( 2 ); " "; A$( 3 )
390 PRINT@ 239, A$( 4 ); " "; A$
(5 ); " ";  A$( 6 )
400 PRINT@271, A$( 7 ); " "; A$(
 8 ); " "; A$( 9 )
410 ' GET MACHINE'S MOVE AND TES
T FOR DONE
420 GOSUB 580
430 GOSUB 830
440 IF DN <> 0 THEN PRINT@ 320,
"                "
450 IF DN = 3 THEN PRINT@ 320, "
I WIN": GOSUB 1190: GOTO 280
460 IF DN = 1 THEN PRINT@ 320, "
DRAW": GOSUB 1190: GOSUB 280
470 PRINT@ 320, "
     ";
480 ' GET HUMAN'S MOVE AND TEST
FOR DONE
490 PRINT @320, "YOUR MOVE:";: I
NPUT I
500 IF A$( I ) <> "-" THEN GOTO
470
510 A$( I ) = "X"
520 Y$ = "X": GOSUB 1130
530 GOSUB 830
540 IF DN <> 0 THEN PRINT@ 320,
"                "
550 IF DN = -1 THEN PRINT@320, "
YOU WIN!": GOSUB 1190: GOTO 280
560 GOTO 420
570 '============================
================================
=======
580 ' NEXT MACHINE MOVE SUBROUTI
NE
590 TC = 0
600 FOR I = 1 TO 9
610 X$ = A$( I )
620 IF X$ = "X" THEN C = 2 ELSE
IF X$ = "O" THEN C = 1 ELSE C =
0
630 TC = TC * 3 + C
640 NEXT I
650 '-------------------
660 ' NOW HAVE BASE 3 CONFIGURAT
ION VALUE - FIND RECORD #
670 IF A$( 1 ) = "-" THEN K = 1
ELSE IF A$( 1 ) = "O" THEN K = 9
69 ELSE IF          A$( 1 ) = "X
" THEN K = 1696
680 FOR I = K TO 2423: IF D( I )
 = TC THEN GOTO 690 ELSE NEXT
690 GET#2, I: R( RP ) = I: RP =
RP + 1
700 BD( 1 ) = ASC( C$ ): BD( 2 )
 = ASC( D$ ): BD( 3 ) = ASC( E$
```

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```
): BD( 4 ) =          ASC( F$ ): B
D( 5 ) = ASC( G$ ): BD( 6 ) = AS
C( H$ ): BD( 7 ) = ASC( I$ ):
   BD( 8 ) = ASC( J$ ): BD( 9 )
 = ASC( K$ )
710 CT = 0
720 FOR I = 1 TO 9: CT = CT + BD
( I ): NEXT
730 C = RND( CT )
740 CT = 0
750 FOR I = 1 TO 9
760 CT = CT + BD( I ): IF CT >=
C THEN GOTO 780
770 NEXT
780 F( FP ) = I: FP = FP + 1
790 A$( I ) = "O"
800 Y$ = "O": GOSUB 1130
810 RETURN
820 '===========================
================================
========
830 ' TEST FOR DONE SUBROUTINE
840 X$ = A$( 1 ) + A$( 2 ) + A$(
 3 ): GOSUB 1070
850 IF DN <> 0 THEN GOTO 1050
860 X$ = A$( 4 ) + A$( 5 ) + A$(
 6 ): GOSUB 1070
870 IF DN <> 0 THEN GOTO 1050
880 X$ = A$( 7 ) + A$( 8 ) + A$(
 9 ): GOSUB 1070
890 IF DN <> 0 THEN GOTO 1050
900 X$ = A$( 1 ) + A$( 4 ) + A$(
 7 ): GOSUB 1070
910 IF DN <> 0 THEN GOTO 1050
920 X$ = A$( 2 ) + A$( 5 ) + A$(
 8 ): GOSUB 1070
930 IF DN <> 0 THEN GOTO 1050
940 X$ = A$( 3 ) + A$( 6 ) + A$(
 9 ): GOSUB 1070
950 IF DN <> 0 THEN GOTO 1050
960 X$ = A$( 7 ) + A$( 5 ) + A$(
 3 ): GOSUB 1070
970 IF DN <> 0 THEN GOTO 1050
980 X$ = A$( 1 ) + A$( 5 ) + A$(
 9 ): GOSUB 1070
990 IF DN <> 0 THEN GOTO 1050
1000 CT = 0
1010 FOR I = 1 TO 9
1020 IF A$( I ) <> "-" THEN CT =
 CT + 1
1030 NEXT
1040 IF CT = 9 THEN DN = 1
1050 RETURN
1060 '--------------------
1070 ' EVALUATE
1080 IF X$ = "XXX" THEN DN = -1:
 GOTO 1110
1090 IF X$ = "OOO" THEN DN = 3:
GOTO 1110
1100 DN = 0
1110 RETURN
```

```
1120 '============================
=================================
========
1130 ' DISPLAY O OR X ON SCREEN
IN PROPER POSITION
1140 IF I < 4 THEN PRINT@207 + (
 I - 1 ) * 2, Y$;: GOTO 1170
1150 IF I < 7 THEN PRINT@239 + (
 I - 4 ) * 2, Y$;: GOTO 1170
1160 PRINT@ 271 + ( I - 7 ) * 2,
 Y$;
1170 RETURN
1180 '============================
=================================
=======
1190 ' REWARD/PUNISHMENT AND HIS
TORY FILE
1200 FOR I = 1 TO 5
1210 IF R( I ) = -1 THEN 1320 EL
SE GET#2, R( I )
1220 BD( 1 ) = ASC( C$ ): BD( 2
) = ASC( D$ ): BD( 3 ) = ASC( E$
 ): BD( 4 ) =           ASC( F$ ):
BD( 5 ) = ASC( G$ ): BD( 6 ) = A
SC( H$ ): BD( 7 ) = ASC( I$ ):
     BD( 8 ) = ASC( J$ ): BD( 9
) = ASC( K$ )
1230 BD( F( I ) ) = BD( F( I ) )
 + DN
1240 IF BD( F( I ) ) < 1 THEN BD
( F ( I ) ) = 1
1250 IF BD( F( I ) ) > 255 THEN
BD( F ( I ) ) = 255
1260 LSET C$ = CHR$( BD( 1 ) ):
LSET D$ = CHR$( BD( 2 ) ): LSET
E$ =                  CHR$( BD( 3
 ) )
1270 LSET F$ = CHR$( BD( 4 ) ):
LSET G$ = CHR$( BD( 5 ) ): LSET
H$ =                  CHR$( BD( 6
 ) )
1280 LSET I$ = CHR$( BD( 7 ) ):
LSET J$ = CHR$( BD( 8 ) ): LSET
K$ =                  CHR$( BD( 9
 ) )
1290 PUT#2, R( I )
1300 NEXT
1310 '-------------------
1320 OPEN "D", #1, "HISTORY", 1
1330 FIELD#1, 1 AS U$
1340 IF DN = 3 THEN V$ = "W" ELS
E IF DN = 1 THEN V$ = "D" ELSE V
$ = "L"
1350 LSET U$ = V$
1360 R = LOF( 1 ): PUT#1, R + 1
1370 CLOSE 1
1380 RETURN
```

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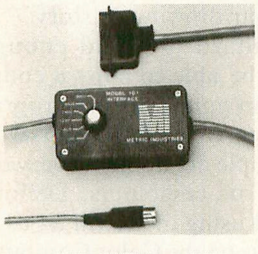

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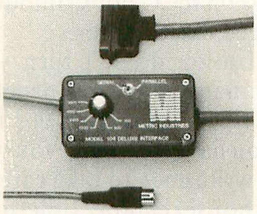

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- ★ **Same Features as 101 Plus**
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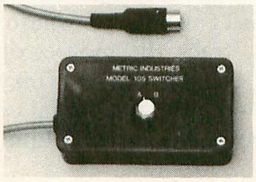
- ★ Comes with cables to connect to your computer and printer
- ★ Can be powered by most printers



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KISSable OS-9

Sending the Right Signals

By Dale L. Puckett
Rainbow Contributing Editor

Our project to write a "shell" program that will give you a starting point for all of your BASIC09 application programs is progressing like the infamous race between the tortoise and the hare. I feel like the tortoise. The hare's ahead at this point, but I'm inching up on him.

Last month, we began the `MVShell` project with the code needed to create a window on your Color Computer 3. That window had a frame around the edge and a menu bar on top. The menu bar displayed only one menu title, the Tandy hourglass icon, which gives you access to the desk accessories that Tandy includes in the *Multi-Vue* package. This month we add to the initial window effort and enter the fascinating world of OS-9 signals. You'll want to follow the two tutorial programs *SigTestOne* and *SigTestTwo* closely. They contain a kernel of information you'll need to really start understanding multitasking, background processing and other OS-9 magic.

Dale L. Puckett, a freelance writer and programmer, serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. His username on Delphi is DALEP: on packet-radio, K0HYD @ N4QQ; on GEnie, D.PUCKETT2; and on CIS, 71446,736.

After this month's additions, `MVShell` will display the same window. However, you'll now see the titles for the standard Files and Edit menu. We emphasize standard here, because that's really the point behind the `MVShell` project. If we all write our OS-9 *Multi-Vue* application programs in the same manner, using the same set of menus, etc., we will soon defeat the OS-9 learning curve.

After you have learned how to run one program, you will know how to run them all. Only the internal details of the problem your program solves will be different. For example, after the standard is in place you will be able to save the words you've typed with your new word processor using the same menu or keystrokes you used to save your *KISSDraw* art. You'll start your spelling checker the same way you start your word processor. You'll open files, create files, save files and delete files in the same manner — no matter what program you're running.

My sources tell me that a meeting of CoCo OS-9 gurus is planned — cross your fingers and read this as "was held" — at RAINBOWfest Chicago to set the standard for the *Multi-Vue* clipboard. After this standard is defined and developers start using it, you'll be able to mark objects — or a number of characters if you're using a word processor — and copy them to the clipboard. Once they are in the clipboard, you will be able to paste them back at another location in your drawing or story.

If the standard is broad enough, maybe you'll be able to copy a couple of objects from your drawing program and then paste them into your word processor. People are doing it every day on a number of computers. Defining standards and using them will let us do the same things on the Color Computer. These are indeed exciting times.

If standardization doesn't turn you on, you'll find many additional benefits in an `MVShell`-type program! For example, once you have `MVShell`, you will never need to write code to take care of a program's housekeeping functions again — `MVShell` will create windows, handle menus, track the mouse, open files, save files, etc., for you. All you will need to do is write the functional code that takes care of the tasks unique to your application program.

Additionally, if you use the code we're developing in `MVShell`, you will always have the standard Tandy desk accessory programs available for use from within your own BASIC09 *Multi-Vue* applications. In fact, you could take this lead one step further and add a number of your own desk accessories under the Tandy menu. Or, you could remove the Tandy desk accessories you

Listing 1: `MVShell`

```
PROCEDURE MVShell
 0000      (* MVShell -- The beginning of an adventure in Multi-Vue
 0038      (*
 003B      (* You'll need this code in each Basic09 Application program
 0077      (* you write for Multi-Vue.
 0092      (*
 0095      (* First, we create Basic09 Type statements
 00C0      (* that emulate the C header files presented in the Multi-Vue
 00FD      (* documentation and supplied as part of the Tandy Program
 0137      (* Developers package.  A quick SysCall routine
 0166      (* at the end lets you see that your definitions
 0197      (* actually work.  We've added the File and Edit menus
 01CD      (* and will show you how to add your own menus.  We'll also be showing
 0213      (* you how to set up a mouse routine that runs in the background
 0253      (* and sends signals to your application when the user clicks the
 0294      (* mouse button.  When we finish this "Shell" or "skeleton"
 02CF      (* application, all you'll need will be your own application
 030C      (* code.
 0314      (*
 0317      (* First, we must define the variables we will use in every
 0352      (* Multi-Vue based program.  These definitions use the same
 038D      (* names as the C header files that come with the Developers
 03CA      (* Pak.  Our first group of definitions is an emulation of the
 0409      (* Wind.H file.
 0418
 0419      (* General definitions
 042F      DIM Null,CallCode,FunCode:BYTE
 043E      DIM StdIn,StdOut:BYTE
 0449      DIM EndStr:STRING[1]
 0455      Null:=0
 045C      EndStr:=CHR$(Null)
 0465      StdOut:=1 \StdIn:=0
 0473
 0474
 0475      (* Define 6809 registers so we can use the get
 04A3      (* and set status calls with syscall
 04C7
 04C8      TYPE Registers=cc,a,b,dp:BYTE; x,y,u:INTEGER
 04ED      DIM Regs:Registers
 04F6
 04F7      (* Window type defs.  They tell the WindInt code within OS-9
 0533      (* what type of box you want to create on the screen.
 0568      DIM WT_NBox,WT_FWin,WT_FSWin,WT_SBox,WT_DBox,WT_PBpox:INTEGER
 0583      WT_NBox:=0 \WT_FWin:=1 \WT_FSWin:=2
 0598      WT_SBox:=3 \WT_DBox:=4 \WT_PBox:=5
 05AE
 05AF      DIM MNEnbl,MNDsbl:BYTE \(* MV talk for Enable and MNDsbl
 05DA      MNEnbl:=1 \MNDsbl:=Null
 05E9
 05EA      DIM WINSync:INTEGER
 05F1      WINSync:=$C0C0
 05F9
 05FA      DIM MN_Move,MN_Clos,MN_Grow,MN_Uscrl,MN_Dscrl,MN_Rscrl,MN_Lscrl

            :BYTE
 0619      DIM MN_Tndy,MN_File,MN_Edit,MN_Styl,MN_Font,MN_Char:BYTE
 0634      MN_Move:=1 \MN_Clos:=2 \MN_Grow:=3 \MN_Uscrl:=4
 0650      MN_Dscrl:=5 \MN_Rscrl:=6 \MN_Lscrl:=7
 0665      MN_Tndy:=20 \MN_File:=21 \MN_Edit:=22
 067A      MN_Styl:=23 \MN_Font:=24 \MN_Char:=8
 068F
 0690      (* Here are some more definitions you'll need in almost all of your
 06D3      (* Basic09 / Multi-Vue application programs.  This group takes care
 0716      (* of the many buffers used within OS-9 Level II.
```

never use and substitute your own. The ability to instantly run a desk accessory program from a program of your own will immediately improve the quality of your life at the Color Computer keyboard.

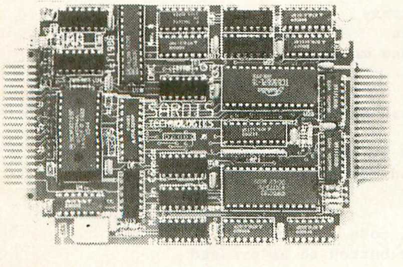
If you haven't gotten around to entering `MVShell` from the June issue of RAINBOW, feel free to skip that version and dig right into this month's code. Everything that was presented last month is included here. If you're just joining our `MVShell` series, you'll notice that we used the same variable names in this program that Tandy uses in its assembly language and C `Defs` files. We hope this will help keep the terminology standard across all languages and make it easier for BASIC09 programmers to communicate with the assembly language and C gurus.

Because BASIC09 does not have built-in `Define` statements like C and PASCAL, we had to improvise. Essentially, we just used a variable to hold our definitions. However, you must note one important point here. Before we defined or initialized any variable to a preset value, we used BASIC09's `TYPE` and `DIM` statements to ensure that the data held by our variables was exactly the same shape as that used by assembly language and C and PASCAL programmers.

This data typing is extremely important here because before we have completed `MVShell` we will have added dozens of `SysCalls` throughout the program. `SysCall` passes data directly to the internals of OS-9. If you pass OS-9 an integer when it expects and only has room for a byte, it will most likely choke. Your program will crash.

Hey, Joe! Send me a "Signal"!

While the theory behind an idea may be simple, implementing that same idea



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...that all the older floppy disk controllers for the CoCo completely tie up (and even halt) the 6809 processor during disk reads and writes? No wonder your keyboard is constantly "losing" characters! Or that your serial port often gives you garbage.

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is often a different story. That's the situation we ran into with `MVShell`. We started with the desire to emulate the assembly language or C "intercept" function in a BASIC09 program. Before we were through, we had tested two completely different approaches. I hope our examples will encourage you to experiment and give you a few ideas about how you can find out what is actually going on inside your program. First, however, let's review a few of the things we learned during the *KISSDraw* series.

In the November column you were introduced to the concept of event-oriented programming — a concept that has given birth to a new generation of productive computer users. Before event-oriented programming hit the Coast, the computer dictated the flow of a program. Today, you control the flow.

When you click the mouse button on your Color Computer, you generate an event. The flow of the program after you push that button depends on the type of event you initiated. Remember the main event loop that forms the heart of every Macintosh application program. Take another look at the English language code below. We're going to give you the basics you'll need to create the same main event loop with a BASIC09 program. Next month, we hope to put one together for you.

```
REPEAT
  Get an event from the event
    queue
  Determine what type of event it is
  Respond to the event if appropriate
UNTIL the application is terminated
```

We used this model when we wrote the main loop for *KISSDraw.* Our "do forever" loop continuously polled the mouse with a "get status" call. When the button was pushed, we determined where the mouse was located. This position dictated the action the program would need to take. If the mouse pointer was in the toolbox, we then determined the tool and let you use it to draw an object on the screen. When you finished with the tool, our program continued to circulate through the main event loop until you pushed the button again.

Multi-Vue programs use a similar strategy. However, there's a big difference between them and the *KISSDraw* model. *Multi-Vue* programs use signals sent by the mouse to determine when and where they need to do something.

```
0747
0748      DIM Grp_Font,Grp_Clip,Grp_Ptr,Grp_Pat2,Grp_Pat4,Grp_Pat6:BYTE
0763      DIM Fnt_S8x8,Fnt_S6x8,Fnt_G8x8:BYTE
0772      DIM Ptr_Arr,Ptr_Pen,Ptr_Lch,Ptr_Slp,Ptr_Ill,Ptr_Txt,Ptr_Sch

           :BYTE
0791      DIM WR_Cntnt,WR_Cntrl,WR_OfWin:BYTE
07A0      DIM Pat_Sld,Pat_Dot,Pat_Vrt,Pat_Hrz,Pat_Xhtc,Pat_Lsnt:BYTE
07BB      DIM Pat_Rsnt,Pat_Sdot,Pat_Bdot:BYTE
07CA
07CB      (* Now that we have reserved space for these variables, we'll need to
0810      (* initialize them.
0823
0824      (* First, the Buffer Group Numbers
0846      Grp_Font:=200
084D      Grp_Clip:=201
0854      Grp_Ptr:=202
085B      Grp_Pat2:=203
0862      Grp_Pat4:=204
0869      Grp_Pat6:=205
0870
0871      (* The Font Buffers
0884      Fnt_S8x8:=1
088B      Fnt_S6x8:=2
0892      Fnt_G8x8:=3
0899
089A      (* The Mouse Pointer Buffers
08B6      Ptr_Arr:=1
08BD      Ptr_Pen:=2
08C4      Ptr_Lch:=3
08CB      Ptr_Slp:=4
08D2      Ptr_Ill:=5
08D9      Ptr_Txt:=6
08E0      Ptr_Sch:=7
08E7
08E8      (* The Window regions for the Mouse
090B      WR_Cntnt:=0
0912      WR_Cntrl:=1
0919      WR_OfWin:=2
0920
0921      (* The Pattern Buffers
0937      Pat_Sld:=0
093E      Pat_Dot:=1
0945      Pat_Vrt:=2
094C      Pat_Hrz:=3
0953      Pat_Xhtc:=4
095A      Pat_Lsnt:=5
0961      Pat_Rsnt:=6
0968      Pat_Sdot:=7
096F      Pat_Bdot:=8
0976
0977      (* We must also tell our program what the mouse looks like.  The following
09C1      (* data structure created with the Basic09 Type statement is similar to the
0A0C      (* one we used in KISSDraw.
0A27
0A28      TYPE rodent=valid,actv,totm:BYTE; rsrv0:INTEGER; ttto:BYTE; tsst
           :INTEGER; cbsa,cbsb,ccta,cctb,ttsa,ttsb,tlsa,tlsb:BYTE

           ; rsrvl,bdx,bdy:INTEGER; stat,res:BYTE; acx,acy,wrx,wry

           :INTEGER
0A99
0A9A      DIM msret:rodent
0AA3
0AA4      (* And, we'll need a few additional definitions in our Visual Shell.
0AE8
0AE9      DIM _update,wxmin,wymin,timout,follow,cur_wind,moussig,miscsig

           ,wait:BYTE
0B10      DIM sigcode,status,wpath:INTEGER
0B1F
0B20      wxmin:=40 \(* minimum screen width for our window
0B4D      wymin:=24 \(* minimum screen height
0B6C
0B6D      _update:=3 \(* update rate for the mouse
0B90      timout:=10 \(* timeout between clicks
0BB0      follow:=1 \(* update cursor when mouse moves.
0BD9      (* set to zero for for no follow
0BF9
0BFA      cur_wind:=0 \(* flag to fork a process on current window
0C2C
0C2D      moussig:=10 \(* signal code returned by the mouse when
0C5D      (* the button is clicked and you need to check
0C8B      (* a pull down menu.
0C9F
0CA0      miscsig:=15 \(* miscellaneous signal code
0CC3      wait:=20 \(* signal code to wait for button to be pressed
0CF9
0CFA      (* Window menu data structures
0D18      (* The first structure holds a menu item descriptor which includes:
0D5B      (* the name of the item, a byte to tell if the item is enabled or not,
0DA1      (* and five reserved bytes.
0DBC
0DBD      TYPE Mistr=_mnttl:STRING[15]; _mienbl:BYTE; _mires(5):BYTE
0DDE      DIM MidScr:Mistr
0DE7
0DE8      (* The next structure holds the definition of a menu.  This includes:
0E2D      (* The name of the menu, the id number of the menu, the width of the
0E71      (* menu, the number of items in the menu and a byte that tells
0EB0      (* if the item is available or not.  Two "reserved" bytes must be
0EF1      (* inserted before the last field.  Make this correction in your
0F31      (* Multi-Vue manual.
0F45      (* The final item in the structure is a pointer to the address of the
0F8A      (* array of structures that hold the individual menu items.
0FC5
0FC6      TYPE mnstr=_mittl:STRING[15]; _mnid,_mnxsiz,_mnnits,_mnenabl

           :BYTE; _reser2,_mnitems:INTEGER
0FF2      DIM MNDscr:mnstr
0FFB
0FFC      (* The final structure defines the contents of an entire window.
103C      (* This includes the title of the window, the number of menus on
107C      (* the window, the minimum height of the window, the minimum
10B8      (* width of the window, a special pair of synch bytes and seven
10F7      (* reserved bytes.  A pointer to an array of menus -- or data of
1137      (* the type "mnstr" -- which we just defined.
1164
1165      TYPE wnstr=_wnttl:STRING[20]; _nmens,_wxmin,_wymin:BYTE; _wnsync

           :INTEGER; _wnres(7):BYTE; _wnmen:INTEGER
119A      DIM WndScr:wnstr
11A3
11A4      (* After we define -- or "type" -- the special data structures
11E2      (* we need for a Multi-Vue based program, we must initialize
121E      (* the data in those structures.  We start with the items we
125A      (* want to appear on our lone menu.  Notice that we needed to
1298      (* add a "null" character or 00 Hex at the end of each string.
12D6      (* We must do this because Basic09 uses $FF hex to define the
1313      (* end of its strings and Multi-Vue expects the "C" style
134D      (* 00 hex for a delimiter.
1367
1368      DIM _tanitms(9):Mistr
1376      _tanitms(1)._mnttl:="Calc"+EndStr
138B      _tanitms(1)._mienbl:=MNEnbl
1399      _tanitms(2)._mnttl:="Clock"+EndStr
13AF      _tanitms(2)._mienbl:=MNEnbl
```

When the mouse button is up and their services aren't required, these programs can go about their business and do something else. They service the mouse only when you generate an event by pushing the mouse button.

This approach is extremely important in the *Multi-Vue* environment where you may have three or four different windows open with a different program running in each. Each program is sharing time with the others. Yet, picture what would happen if a program like *KISSDraw* were running in one of the windows. Since it runs in a tight loop that constantly reads the mouse, it would hog much of the 6809 microprocessor's time. Other programs running on the same Color Computer would appear sluggish at best. A real-world example of a program that hogs the microprocessor is the device driver for the bit banger port, /t1, on the rear panel of your Color Computer. When an OS-9 program is using this port, other processes barely function.

Now, compare this with the true "event-oriented" approach. In `MVShell` and many other programs designed to run in a multitasking environment, a process is put to sleep when it is not actively doing anything. It awakens

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only after receiving a signal from you or the hardware. While the process is asleep, other programs running on the same computer shine.

Most *Multi-Vue* programs emulate the technique shown in the Macintosh model above. Our `MVShell` will do the same. Our first versions of `MVShell` will deal with one event at a time; however, with a little help from our friends we may be able to show you how to set up and handle a queue of events later on.

The Easy Approach

This month we learned once again — and quickly — that the "easy" way is usually not the way to go. But at least it got us to thinking. Before we ran into the easy way, we had been stumped. Your mission, should you decide to accept it, is to emulate the model below, which forms the heart of most *Multi-Vue* applications written in C:

```
Create Window
Initialize and start mouse
Set Intercept trap

DO

  Set signal code equal to zero
  Tell the mouse which signal to
    send (when button is clicked)
  Put process to sleep
  Wake up and handle chores
    (after receiving a signal)
FOREVER
```

When you first gaze at the algorithm above, it looks like it should be a fairly simple task — and it is, in assembly language and C. However, the task becomes a little more complicated when you are using BASIC09; this language does not give you a way to set an intercept.

The brainstorm that resulted in our easy solution — *SigTestOne* — followed a telephone conversation with OS-9 Users Group *MOTD* editor, Bill Brady. Brady mentioned using BASIC09's `ON ERROR GOTO` statement to trap signals from the mouse. After all, OS-9 treats a signal similar to an error. Down the yellow brick road we traveled. I wrote *SigTestOne* at the terminal and proudly typed `run`.

Unfortunately, the result was nothing to be proud of! *SigTestOne* did work — almost! When I clicked the mouse button, the program jumped to the `ON ERROR GOTO` routine at Line 100 as planned. However, the error number reported by the program was #000 — the signal to "kill" a process.

```
13BD        _tanitms(3)._mnttl:="Calendar"+EndStr
13D6        _tanitms(3)._mienbl:=MNEnbl
13E4        _tanitms(4)._mnttl:="Control"+EndStr
13FC        _tanitms(4)._mienbl:=MNEnbl
140A        _tanitms(5)._mnttl:="Printer"+EndStr
1422        _tanitms(5)._mienbl:=MNEnbl
1430        _tanitms(6)._mnttl:="Port"+EndStr
1445        _tanitms(6)._mienbl:=MNEnbl
1453        _tanitms(7)._mnttl:="Help"+EndStr
1468        _tanitms(7)._mienbl:=MNEnbl
1476        _tanitms(8)._mnttl:="Shell"+EndStr
148C        _tanitms(8)._mienbl:=MNEnbl
149A        _tanitms(9)._mnttl:="Clipboard"+EndStr
14B4        _tanitms(9)._mienbl:=MNDsbl
14C2
14C3
14C4        DIM _filitms(6):Mistr
14D2        _filitms(1)._mnttl:="New"+EndStr
14E6        _filitms(1)._mienbl:=MNEnbl
14F4        _filitms(2)._mnttl:="Open"+EndStr
1509        _filitms(2)._mienbl:=MNEnbl
1517        _filitms(3)._mnttl:="Save"+EndStr
152C        _filitms(3)._mienbl:=MNEnbl
153A        _filitms(4)._mnttl:="Abandon"+EndStr
1552        _filitms(4)._mienbl:=MNEnbl
1560        _filitms(5)._mnttl:="Print"+EndStr
1576        _filitms(5)._mienbl:=MNEnbl
1584        _filitms(6)._mnttl:="Quit"+EndStr
1599        _filitms(6)._mienbl:=MNEnbl
15A7
15A8        DIM _editms(6):Mistr
15B6        _editms(1)._mnttl:="Undo"+EndStr
15CB        _editms(1)._mienbl:=MNEnbl
15D9        _editms(2)._mnttl:="Cut"+EndStr
15ED        _editms(2)._mienbl:=MNEnbl
15FB        _editms(3)._mnttl:="Copy"+EndStr
1610        _editms(3)._mienbl:=MNEnbl
161E        _editms(4)._mnttl:="Paste"+EndStr
1634        _editms(4)._mienbl:=MNEnbl
1642        _editms(5)._mnttl:="Clear"+EndStr
1658        _editms(5)._mienbl:=MNEnbl
1666        _editms(6)._mnttl:="Show"+EndStr
167B        _editms(6)._mienbl:=MNEnbl
1689
168A        (* Now we'll set up the entire menu
16AD
16AE        DIM Tndy_Mn:mnstr
16B7        Tndy_Mn._mittl:="Tandy"+EndStr
16CB        Tndy_Mn._mnid:=MN_Tndy
16D7        Tndy_Mn._mnxsiz:=10
16E2        Tndy_Mn._mnnits:=9
16ED        Tndy_Mn._mnenabl:=MNEnbl
16F9        Tndy_Mn._mnitems:=ADDR(_tanitms)
1707
1708        DIM File_Mn:mnstr
1711        File_Mn._mittl:="Files"+EndStr
1725        File_Mn._mnid:=MN_File
1731        File_Mn._mnxsiz:=10
173C        File_Mn._mnnits:=6
1747        File_Mn._mnenabl:=MNEnbl
1753        File_Mn._mnitems:=ADDR(_filitms)
1761
1762        DIM Edit_Mn:mnstr
176B        Edit_Mn._mittl:="Edit"+EndStr
177E        Edit_Mn._mnid:=MN_Edit
178A        Edit_Mn._mnxsiz:=10
1795        Edit_Mn._mnnits:=6
17A0        Edit_Mn._mnenabl:=MNEnbl
17AC        Edit_Mn._mnitems:=ADDR(_editms)
17BA
17BB        (* Now that we have defined the items in the menu and the menu itself,
1801        (* we can define the window that we want the menu to appear in.
1840        (* First, we must create an array of menus that contains all of the
1883        (* menus we hope to use.  After we have reserved space in memory using
18C9        (* Basic09's DIM statement, we must intialized each element in the array.
1912        (* Here, we create an array of three menus.
193D
193E        DIM Menus(3):mnstr
194C
194D        Menus(1):=Tndy_Mn
1958        Menus(2):=File_Mn
1963        Menus(3):=Edit_Mn
196E
196F        WndScr._wnttl:="KISSDraw"+EndStr
1986        WndScr._nmens:=3
1991        WndScr._wxmin:=80
199C        WndScr._wymin:=24
19A7        (* _wnres, an array of seven reserved bytes, sits here
19DD        WndScr._wnsync:=WINSync
19E9        WndScr._wnmen:=ADDR(Menus)
19F7
19F8        (* The data structures have all been set up now.  It is time to make a
```

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I looked over my code. Stumped, I picked up the phone and called Kevin Darling. "It'll work, but you have to pack the code first," he said.

I did. It did! But this solution was not appropriate. One of the advantages of an interactive programming environment like BASIC09 is the fact that you can change things continuously and check the results instantly. If you are forced to go into a "packed" (compiled before you run it) mode, you lose this interactive advantage.

Generating a Real Intercept

Kevin Darling did a lot of experimenting with *Multi-Vue* early on. One of those experiments involved programming *WindInt* using BASIC09. He also stumbled into the problem above. He solved it by using the `ON ERROR GOTO` approach in conjunction with a Boolean variable. If the Boolean "packed" was true, he used the `MsSig SetStat` call to tell the mouse to return a signal with a value of 2. If "packed" was false, it returned a 1 signal. If the code hadn't been packed, the `ON ERROR GOTO` routine received a valid "wake up" signal — 1 — and Darling was able to go ahead and process it.

I wanted a simpler approach. I get confused easily when I must follow Boolean variables through decision trees, and I wanted to keep the overall flow of the program as simple as possible. After all, this is "KISSable OS-9."

"Why can't I write a short intercept routine in machine language, store it in the data area, point to it using BASIC09's `ADDR` function, and run it?" I asked.

"Great idea!" Darling said. "It should work."

With that, I was off on a daylong experiment. As it turned out, my intercept routine was only four bytes long. I used a fifth byte to return the value of the signal sent by the mouse. Here's the code in 6809 assembly language:

```
STB #ADDR(IceptCode)+4
RTI
```

In pure machine language that code looks like this: `F7 HH LL 3B`.

To get that code into memory I defined a special data type named `IntCeptCod`. I then dimensioned — or reserved space for — a variable named `IceptCode` of type `IntCeptCod`. The *new* data type had a single byte followed by an integer to hold the address, followed by two individual bytes. The first would hold the `RTI` code. The second gave me an empty byte in mem-

```
 1A3E       (* set status call to initialize the window.  We will use _ss_wset.  This
 1A87       (* call needs three parameters.  The path number, the window type and a
 1ACF       (* pointer to the data structure defining the window.
 1B04
 1B05       (* But first, we must turn off the cursor
 1B2E       (* If we don't, we will occasionally write garbage on the
 1B67       (* screen where we don't want it.  A "gfx2" routine will
 1B9F       (* take care of this for us.
 1BBB       RUN Gfx2(StdOut,"CurOff")
 1BCE
 1BCF       (* Now we'll make a SysCall with the Set Window function
 1C07       (* code to prove that it works.
 1C26
 1C27       CallCode:=$8E \(* Set Status Code
 1C41       Regs.a:=StdOut
 1C4D       Regs.b:=$86 \(* SS.WnSet function code
 1C72       Regs.x:=ADDR(WndScr)
 1C80       Regs.y:=WT_FWin
 1C8C
 1C8D       RUN SysCall(CallCode,Regs)
 1C9C       PRINT #StdOut,"Hello <Insert Your Name Here>"
 1CC2       END
 1CC4
```

Listing 2: `SigTestOne`

```
PROCEDURE SigTestOne
 0000       (* Short program to test method of emulating intercept routine
 003E
 003F       DIM ErrNum:BYTE
 0046
 0047       ON ERROR GOTO 100 \(* Set trap
 0058
 0059       (* Initialize Mouse and start it running
 0081
 0082       TYPE Registers=cc,a,b,dp:BYTE; x,y,u:INTEGER
 00A7
 00A8       DIM Regs:Registers
 00B1       DIM CallCode,Path,StdIn,StdOut:BYTE
 00C4       DIM Follow,FollowNot:BYTE
 00CF       DIM SampTime:INTEGER
 00D6       DIM bval,ccval:BYTE
 00E1
 00E2       Follow:=1
 00E9       FollowNot:=0
 00F0       StdIn:=0
 00F7       StdOut:=1
 00FE       SampTime:=$030A
 0106
 0107       CallCode:=$8E \(* I_SetStt call
 011F       Path:=StdIn
 0127       Regs.a:=Path
 0133       Regs.b:=$89 \(* ss.Mouse
 014A       Regs.x:=SampTime
 0156       RUN SysCall(CallCode,Regs)
 0165
 0166       (* Now tell Mouse to return a signal with a value of 10
 019D
 019E       CallCode:=$8E \(* I_SetStt call
 01B6       Path:=StdIn
 01BE       Regs.a:=Path
 01CA       Regs.b:=$8A \(* ss.MsSig
 01E1       Regs.x:=$0A \(* $000A is 10
 01FB
 01FC       RUN SysCall(CallCode,Regs)
 020B
 020C       PRINT "Test is starting, click mouse!"
 022E
 022F       (* Now stall for test
 0244
 0245       FOR xray:=1 TO 10000
 0258       NEXT xray
 0263
 0264       PRINT "Test is stopping now"
 027C       END
 027E
 027F 100   ErrNum:=ERR
 0288       bval:=Regs.b
 0293       ccval:=Regs.cc
 029E       PRINT bval,ccval,ErrNum
 02AB       IF ErrNum=10 THEN PRINT "It's the Mouse"
 02C8       ELSE
 02CC         PRINT "Who knows?"
 02DA       ENDIF
 02DC       END
 02DE
```

Listing 3: SigTestTwo

```
PROCEDURE SigTestTwo
 0000      (* Procedure to test possibility of setting intercept
 0035      (* trap within Basic09 program
 0053      (* First, we define a special data type for our intercept
 008C
 008D      TYPE IntCeptCod=StBCode:BYTE; IntAddr:INTEGER; RTICode,IntResult

            :BYTE
 00A8      DIM IceptCode:IntCeptCod
 00B1
 00B2      (* Now that we have defined the data area where we will store
 00EF      (* our intercept code, we will initialize it.
 011C
 011D      IceptCode.StBCode:=$F7
 0129      IceptCode.IntAddr:=ADDR(IceptCode)+4
 013A      IceptCode.RTICode:=$3B
 0146
 0147      (* We must also define a data type to hold the 6809 registers
 0184      (* so we can pass the parameters to SysCall.
 01B0
 01B1      TYPE Registers=cc,a,b,dp:BYTE; x,y,u:INTEGER
 01D6      DIM Regs:Registers
 01DF
 01E0      (* And a few more variables to enhance readability
 0212
 0213      DIM F_Icpt,F_Sleep,CallCode:BYTE
 0222      DIM I_SetStt,SS_MsSig,StdIn,StdOut,SS_GIP,SS_Mouse:BYTE
 023D      DIM MouseSig,Follow:INTEGER
 0248      DIM Grp_Ptr,Ptr_Arr:BYTE
 0253
 0254      Grp_Ptr:=202
 025B      Ptr_Arr:=1
 0262      F_Icpt:=$09
 026A      F_Sleep:=$0A
 0272      I_SetStt:=$8E
 027A      SS_MsSig:=$8A
 0282      SS_GIP:=$94
 028A      SS_Mouse:=$89
 0292      Follow:=1
 0299      StdIn:=0
 02A0      StdOut:=1
 02A7      MouseSig:=10
 02AE
 02AF      (* We must turn on the mouse and set its global parameters
 02E9      (* Here we tell the system we are using a high resolution
 0323      (* mouse plugged into the right joystick port.
 0351
 0352      Regs.a:=StdIn
 035E      Regs.b:=SS_GIP
 036A      Regs.x:=$0101 \(* HiRes, Right Joystick
 038E      Regs.y:=$FFFF \(* Do not change timing
 03B1      CallCode:=I_SetStt
 03B9      RUN SysCall(CallCode,Regs)
 03C8      PRINT "I have set the mouse's global parameters"
 03F4
 03F5      (* Now we must tell the mouse how often to update itself
 042D      (* and when it should timeout.  We also must tell the
 0463      (* graphics cursor to follow the mouse.  We do the latter
 049C      (* by setting the 6809 Y-register to "Follow" or "1" before
 04D8      (* the call.  This parameter is undocumented in early versions
 0516      (* of the OS-9 Level II documentation.
 053C
 053D      Regs.a:=StdIn
 0549      Regs.b:=SS_Mouse
 0555      Regs.x:=$0301 \(* Update / timeout info
 0579      Regs.y:=Follow
 0585      CallCode:=I_SetStt
 058D      RUN SysCall(CallCode,Regs)
 059C      PRINT "I have started mouse."
 05B5
 05B6      (* Now we can set up the 6809 registers and make the call
 05EF      (* to set up the intercept.
 060A
 060B      CallCode:=F_Icpt
 0613      Regs.x:=ADDR(IceptCode)
 0621      Regs.u:=ADDR(IceptCode)+4
 0632      RUN SysCall(CallCode,Regs)
 0641      PRINT "I have set the intercept"
 065D
 065E      (* We'll turn on the Graphics Cursor so you can
 068D      (* watch mouse movement on the screen.  We'll make
 06BF      (* it an arrow.
 06CE
 06CF      RUN gfx2("gcset",Grp_Ptr,Ptr_Arr)
 06E6
 06E7      (* The main loop of our future program will start here
 071D
 071E      LOOP  \(* Do this forever
 0732
```

ory I could use to store the signal from the mouse.

After dimensioning the variable IceptCode, I initialized it with straightforward BASIC09 assignment statements. Later in the program, I used SysCall to run the OS-9 F$Icpt routine. To do this, I loaded the 6809's X register with the address of the "intercept" routine I had stored in BASIC09's data area, loaded the U register with the address where I wanted to receive the signal from the mouse, and made the call.

Later, after the process had been awakened by the mouse, I could check the value of IceptCode.IntResult to see if the mouse had generated the signal. This week, we are returning only one signal from the mouse. Later, we'll most likely have the mouse send back different signals to indicate different situations. Stay tuned, this project just might turn into a lot of fun.

A Trip Through the Code

We used a few SysCall functions when we presented the *KISSDraw* series last year, but not too many. Perhaps this is a good time for a review of the technique. Essentially, running a SysCall is similar to running a GOSUB. Both statements run a subroutine. The difference lies in where the subroutines are located.

When you type GOSUB 1000, you are telling BASIC09 to jump to a subroutine that is located at Line 1000 in your program. After it runs that subroutine, BASIC09 will return the control of the program to the line following the GOSUB statement.

SysCall is a jump to a subroutine within the heart of the OS-9 operating system itself. When control returns from the SysCall to your BASIC09 program, execution continues at the line following the SysCall — just like it does with the GOSUB statement.

The subroutines you call with the SysCall function are executed by loading the 6809's B register with a special CallCode. You must also often pass additional information to the OS-9 subroutine when you run SysCall.

When you make one of these system calls from within an assembly language program, you load the 6809 registers directly and then make the call. This means that when you want to run them from BASIC09 you must have a way to preload the 6809 registers before you run SysCall. You do this by creating a special data type that effectively emulates a 6809 microprocessor. In

SigTestTwo we call this new data type `Registers`. After we define it, we reserve a space in memory for it with the BASIC09 `DIM` statement. We named that space `Regs`.

To run `SysCall` then, we load our pseudo 6809 — `Regs` — with the proper information and then run `SysCall` with two parameters. The first parameter is always the calling code. The second is always `Regs`, the pseudo 6809.

We know what kind of information to put in each register by consulting the OS-9 technical documentation. It lists each call separately and gives the entry and exit conditions. By entry conditions, we mean it tells us what to load into each register before we run `SysCall`. The exit conditions tell us what we can expect to find in each of the 6809's registers upon exit. When we run `SysCall`, we will find these exit values in the pseudo 6809, `Regs`.

Readability Can't Be Overlooked

Let's use our call to the internal OS-9 function `MsSig` for a readability example. Take a look at it now:

```
Regs.a:=StdIn
Regs.b:=SS_MsSig
Regs.x:=MouseSig
CallCode:=I_SetStt
RUN SysCall(CallCode,Regs)
```

When you read this code, you can determine in English what you are loading into each of the 6809's registers as well as the function you want to run. Now consider this — the program would have worked in exactly the same manner if we had decided to type the following:

```
Regs.a:=0
Regs.b:=$8A
Regs.x:=10
CallCode:=$8E
RUN SysCall(CallCode,Regs)
```

Do you think you would remember what the second string of code would do if you read it two weeks after you wrote it? I certainly wouldn't! Notice how we reserved space and initialized all of these variables early in the program. Once we type

```
Grp_Ptr:=202
Ptr_Arr:=1
```

we could type `Run gfx2("gcset", Grp_Ptr,Ptr_arr)`, rather than `Run gfx2("gcset",202,1)`.

Which of those lines means more to you?

```
0733        PRINT
0735        PRINT "Type <Control E> or <BREAK> to stop !!!"
0760
0761        IceptCode.IntResult:=0 \(* Initialize Signal Report
0787
0788        (* Tell mouse which signal you want
07AB        (* it to return when the button is pushed.  Do
07D9        (* this with the SS_MsSig set status call
0802
0803        Regs.a:=StdIn
080F        Regs.b:=SS_MsSig
081B        Regs.x:=MouseSig
0827        CallCode:=I_SetStt
082F        RUN SysCall(CallCode,Regs)
083E        PRINT "I have given the mouse a signal to send back to the process."
087E        PRINT "Now, I am putting the process to sleep."
08A9
08AA        (* Now we must tell the process to go to sleep until
08DE        (* it receives a signal to wake up.
0901
0902        CallCode:=F_Sleep
090A        Regs.x:=0 \(* Sleep forever -- at least till signal
093D        RUN SysCall(CallCode,Regs)
094C
094D        (* After a signal or interrupt wakes up the system, we
0984        (* should be able to find out if it was the mouse
09B5        (* that generated the signal by looking at IceptCode.Result
09F0        (* When we arrive here, the process has just awakened
0A25        (* and we will test to see if the signal came from the
0A5B        (* mouse.
0A64
0A65      EXITIF IceptCode.IntResult=2 THEN
0A74      ENDEXIT
0A78
0A79        PRINT "MouseSig is now, "; MouseSig
0A92        PRINT "IceptCode.IntResult is now, "; IceptCode.IntResult
0AB9        IF IceptCode.IntResult=MouseSig THEN
0AC9          PRINT "It's the Mouse!!!"
0ADE        ELSE
0AE2          PRINT "The signal returned was, "; IceptCode.IntResult
0B06        ENDIF
0B08      ENDLOOP
0B0C
0B0D      (* Always turn off graphics cursor before leaving program
0B46
0B47      RUN gfx2("gcset",0,0)
0B5A
0B5B      END
0B5D
0B5E
```

Listing 4: `SkipMuf` (*continued from last month*)

```
667     0   1 (*
668     0   1  * Askabort - Asks user if he wants to abort computation in order
669     0   1  *           to reenter data.
670     0   1  *)
671     0   1
672     0   1   PROCEDURE Askabort(VAR path : text);
673     0   1
674     0   1   BEGIN
675     0   2     Clrscrn(path);
676     6   2     Write(path, 'Prediction for:  ', name);
677    24   2     IF (call[1] <> ' ') THEN
678    39   3       Write(path, ', ', call);
679    57   2     Writeln(path);
680    62   2     Write(path, 'Date:  ', day:2:0, ' ', moname:3, '  ');
681   102   2     Writeln(path, 'SSN: ', sunspot:3:0, '  Flux: ', flux:3:0);
682   139   2     Write(path, 'To:  ', ocntnt, ' (', ocity, ', ', ocntry, '), ');
683   197   2     Writeln(path, 'Lat ', olat:6:2, ', Lon ', olon:7:2);
684   234   2     Writeln(path);
685   241   2     Write(path, 'Continue computation (Y/N)?  ');
686   253   2     Prompt(path);
687   258   2     Reset(path);
688   268   2     Readln(path, answer);
689   280   2     Rewrite(path);
690   290   2   END;
693     0   1 (*
694     0   1  * Wantprnt - Asks if user wants printout on printer.
695     0   1  *)
696     0   1
697     0   1   PROCEDURE Wantprnt(VAR path : text);
698     0   1
699     0   1   VAR
700    0D   1     answer : char;
701   -1D   1
702   -1D   1   BEGIN
703     0   2     Write(path, 'Want printout of results (Y/N)?  ');
704    14   2     Prompt(path);
705    17   2     Reset(path);
```

```
706    27   2     Readln(path, answer);
707    37   2     Rewrite(path);
708    47   2     IF ((answer = 'Y') OR (answer = 'y')) THEN
709    61   3       printout := TRUE
710    61   3     ELSE
711    69   3       printout := FALSE;
712    74   2   END;
715     0   1 (*
716     0   1  * Hourmuf - computes MUF for specific hour of day.
717     0   1  *)
718     0   1
719     0   1   FUNCTION Hourmuf(olat,olon,mylat,mylon,p,q,r,s,k7,hour:real):real;
720     0   1
721     0   1   CONST
722    0D   1     e      = 2.71821828;
723    0D   1     pi     = 3.14159265;
724    0D   1     twopi  = 6.28318531;
725    0D   1     halfpi = 1.57079633;
726    0D   1
727    0D   1   VAR
728    0D   1     gl,k6,k5,j9,kl,a,b,c,d,w0:real;
729   -50D  1     l0,yl,y2,k8,k9,g0,m9,t,t4,c0,t9,t6,g9:real;
730  -115D  1     g8,u,g7,g2,ul,u2,u3,step,test:real;
731  -160D  1
732  -160D  1
733  -160D  1     FUNCTION Acs (x:real):real;
734    0D   2
735    0D   2     VAR
736    0D   2       result    : real;
737    -5D  2
738    -5D  2     BEGIN
739     0   3       result := halfpi - Arctan(x / sqrt(-x * x + 1));
740    31   3       acs := result
741    31   3     END;
742     0   2
743     0   2
744     0   2     FUNCTION Rpower (y,x:real):real;
745     0   2
746     0   2     VAR
747    0D   2       result:real;
748    -5D  2
749    -5D  2     BEGIN
750     0   3       IF x = 0.0
751     5   3         THEN result := 1.0
752    15   4         ELSE result := Exp(x * Ln(y));
```

Here's another programming tip. Debugging can be awful if you don't give yourself enough clues. That's the purpose of all those `Print` statements in *SigTestTwo*. Every time I run a `SysCall`, I print a report on the screen to let me know where I am in the program. By looking at these reports, I can tell when or if the program goes astray.

Caveats and What Comes Next?

Before we secure this tutorial and turn you loose to run the code, you should take one or two precautions. First, you must run *SigTestTwo* in a graphics window. You cannot run the `gfx2 gcset` function to display the mouse pointer in a text type window. Additionally — for a reason as yet unknown — you must run *SigTestTwo* from a shell that was not created by *Multi-Vue*. We'll be looking deeper into this slight inconvenience to see if we can find the cause. Cross your fingers! You can, however, run *SigTestTwo* from a shell created by another shell that was not started by *Multi-Vue*.

In other words, you can have *Multi-Vue* running in one window and a second shell running in another window. Then, start *SigTestTwo* in this

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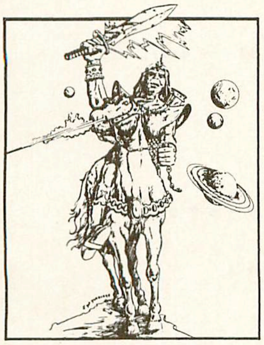

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This appears to be a side window. The curtains are drawn and I can make out the figure of a man inside.
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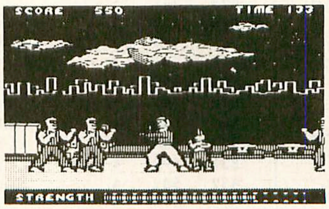

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second window. However, if you use the `SHELL` command under the Files menu to create a third shell, you will not be able to run *SigTestTwo* under it. For some reason, if you are running in a shell created by *Multi-Vue*, the signal returned when you click the mouse in *SigTestTwo* is zero — the signal to kill the process. And, as you might guess, that's exactly what happens. It's interesting to note that Kevin Darling's *MVTest*, another BASIC09 program, exhibits exactly the same behavior — and he uses the special packed Boolean / `ON ERROR GOTO` algorithm. Fixing this one just might be a real challenge.

> ***"The next step in the evolution of* MVShell *will be to add the code from* SigTestTwo *to the tail-end of the code in this month's* MVShell."**

Another caveat comes with using *SigTestTwo* in its present form. Once you have run this procedure, you will not be able to use the BREAK key or the CTRL-E key combination from within BASIC09 without restarting BASIC09. This happens because our own intercept routine in *SigTestTwo* takes the place of the intercept routine BASIC09 sets. The solution to this problem isn't too difficult but would have made the code for this month's tutorial too long. We'll try to get it in next month. If you want to jump ahead of us, here are the steps you will need to follow at the start of your BASIC09 program:

- Get BASIC09's Process ID using a `GetID SysCall`
- Use `SysCall` to run `F$GetProc`
- Save the 512-byte array returned by `F$GetProc` into an array
- Save the intercept vector address and data address in another variable
- Use the intercept `SysCall` to restore them before you exit your program

You must also remember that if you set your own intercept like we did in *SigTestTwo*, the `ON ERROR GOTO` function will no longer work. You will need to process the expected errors each time with your own code, which you wake up following a signal.

The next step in the evolution of `MVShell` will be to add the code from *SigTestTwo* to the tail-end of the code in this month's `MVShell`. Additionally, we'll need to add calls to *WindInt*'s `SS_MnSel`, `SS_UMBar` and, if we have

```
753     41  3       rpower := result
754     41  3     END;
755      0  2
756      0  2
757      0  2     FUNCTION Checkval (x:real):real;
758      0  2
759      0  2     BEGIN
760      0  3       IF (x >= 1.0) OR (x <= -1.0)
761     22  3         THEN
762     26  4           IF x >= 1.0
763     29  4             THEN x :=  0.999999999
764     39  5             ELSE x := -0.999999999;
765     60  3       checkval := x
766     60  3     END;
767      0  2
768      0  2
769      0  2     FUNCTION Sgn (x:real):real;
770      0  2
771      0  2     VAR
772     0D  2       result:real;
773    -5D  2
774    -5D  2     BEGIN
775      0  3       IF x < 0.0
776      5  3         THEN result := -1.0;
777     24  3       IF x = 0.0
778     27  3         THEN result :=  0.0;
779     46  3       IF x > 0.0
780     49  3         THEN result :=  1.0;
781     68  3       sgn := result
782     68  3     END;
783      0  2
784      0  2
785      0  2     FUNCTION Minusexp (x:real):real;
786      0  2
787      0  2     VAR
788     0D  2       result:real;
789    -5D  2
790    -5D  2     BEGIN
791      0  3       result   := Rpower((1.0 / e),(-1.0 * x));
792     33  3       minusexp := result
793     33  3     END;
794      0  2
795      0  2
796      0  2   BEGIN {hourmuf}
797      0  2     k7 := Checkval(k7);
798     12  2     gl := Acs(k7);
799     22  2     k6 := 1.59 * gl;
800     35  2     IF k6 < 1.0
801     38  2       THEN k6 := 1.0;
802     57  2     k5 := 1.0 / k6;
803     70  2     IF k5 <> 1.0
804     73  2       THEN k5 := 0.5;
805     92  2     j9 := 100.0;
806    101  2     a  := (r - p * Cos(gl)) / (q * Sin(gl));
807    127  2     yl := 0.0172 * (10.0 + (month - 1.0) * 30.4 + day);
808    165  2     y2 := 0.409 * Cos(yl);
809    180  2     kl := 1.0 / (2.0 * k6);
810    200  2     test := Abs(1.0 - kl);
811    214  2     step := Abs(0.9999 - 2 * kl);
812    231  2     REPEAT
813    231  2       b  := gl * kl;
814    241  3       c  := p * Cos(b) + q * Sin(b) * a;
815    270  3       d  := (Cos(b) - c * p) / (q * Sqrt(1.0 - c * c));
816    307  3       d  := Checkval(d);
817    317  3       d  := Acs(d);
818    327  3       w0 := mylon + Sgn(Sin(olon - mylon)) * d;
819    351  3       IF (w0 < 0.0) OR (w0 >= twopi)
820    371  3         THEN
821    375  4           IF w0 < 0.0
822    378  4             THEN w0 := w0 + twopi
823    391  5             ELSE w0 := w0 - twopi;
824    417  3       c  := Checkval(c);
825    427  3       l0 := halfpi - Acs(c);
826    444  3       k8 := 3.82*w0+12.0+0.13*(Sin(yl)+1.2*Sin(2*yl));
827    493  3       k8 := k8-12.0*(1+Sgn(k8-24.0))*Sgn(Abs(k8-24.0));
828    545  3       IF Cos(l0 + y2) <= -0.26
829    554  3         THEN BEGIN {then 1}
830    564  4           k9 := 0.0;
831    573  4           g0 := 0.0;
832    582  4           m9 := 2.5 * gl * k5;
833    599  4           IF m9 > halfpi
834    602  4             THEN m9 := halfpi;
835    621  4           m9 := Sin(m9);
836    629  4           m9 := 1.0 + 2.5 * m9 * Sqrt(m9);
837    655  4           END {then 1}
838    655  4         ELSE BEGIN {else 1}
839    658  4           k9 := (-0.26+Sin(y2)*Sin(l0))/(Cos(y2)*Cos(l0)
840    684  4                 +0.001);
841    698  4           k9 := 12.0-Arctan(k9/Sqrt(Abs(1.0-k9*k9)))
842    725  4                 *7.639437;
843    738  4           t  := k8-0.5*k9+12.0*(1.0-Sgn(k8-0.5*k9))
844    786  4                 *Sgn(Abs(k8-0.5*k9));
845    811  4           t4 := k8+0.5*k9-12.0*(1.0+Sgn(k8+0.5*k9-24.0))
846    863  4                 *Sgn(Abs(k8+0.5*k9-24.0));
```

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time, the code to process a few of the menu selections. Hopefully, by the time we finish the project you'll have all of *Multi-Vue*'s desk accessories and other functionality available to you from each of your BASIC09 programs.

Other Good News and Notes

The new `GShell` from Kent Meyers keeps getting better. I'm still running one of the very early versions, and it sings. However, conversations with several people around the country tell me I'm really missing out. The later versions really shine! For example, we now have a wastebasket on our desktop. And thanks to Kent's ingenuity, it's easier to use than the one on the Macintosh. On the Macintosh you must drag your files to the wastebasket. On our Color Computer 3 with the new `GShell`, you merely click on the file you want to throw away to select it. Then, move the mouse to the wastebasket and click. Presto! All gone!

Additionally, if you put a ? in your `AIF` file with the new `GShell`, you will get a prompt for additional parameters. And Meyers has come up with a simple modification to `SCF` and `CC3io` that lets you continue after a pause by clicking the mouse anywhere on the screen. He also redid the "Sure ?" box so that it pops up right where your mouse is sitting when you activate an action from the menu bar that requires it. And if that's not enough, there's now a quick shell. When you need another shell, just press S. Magic!

But we've saved the real good news for last. This is another cross-your-fingers revelation, however, because this column will be printed after the fact — but the OS-9 Users Group plans to sell the `IPatch` that generates the new `GShell` from the original Tandy file at RAINBOWfest Chicago. Hope you were there to get a copy.

Speaking of the Users Group, the address is Suite R-237, 1715 Fowler Ave., Tampa, FL 33612. The cost for an individual membership is just $25 per year. The benefits are many and include access to a growing library of valuable public domain software and a subscription to *MOTD*, the UG newsletter. Dave Kaleita, Pete Lyall, Kevin Darling, George Dorner and Carl Kreider are doing a heck of a job. Join them!

And speaking of credit — Ron Lammardo's name was somehow edited out of our praises of the new `Shell+`. Ron provided many of the ideas for this team project and wrote the latest version. Great job, Ron! ☐

```
  895  4            c0 := Abs(Cos(10 + y2));
  908  4            t9 := 9.7 * Rpower(c0,9.6);
  931  4            IF t9 <= 0.1
  934  4              THEN t9 := 0.1;
  953  4            m9 := 2.5 * gl * k5;
  970  4            IF m9 > halfpi
  973  4              THEN m9 := halfpi;
  992  4            m9 := Sin(m9);
 1000  4            m9 := 1.0 + 2.5 * m9 * Sqrt(m9);
 1027  4            IF ((t4<t) AND ((hour-t4)*(t-hour)<=0.0))
 1057  4               OR ((t4>=t) AND ((hour-t)*(t4-hour)>0.0))
 1087  4              THEN BEGIN {then 2}
 1091  5                t6 := hour+12.0*(1.0+Sgn(t-hour))
 1118  5                      *Sgn(Abs(t-hour));
 1136  5                g9 := pi * (t6 - t) / k9;
 1157  5                g8 := pi * t9 / k9;
 1174  5                u  := 0.5 * (t - t6) / t9;
 1195  5                IF u < 0.0
 1198  5                  THEN u := Minusexp(u)
 1212  6                  ELSE u := Exp(u);
 1229  5                ul := -0.5 * k9 / t9;
 1247  5                IF ul < 0.0
 1250  5                  THEN ul := Minusexp(ul)
 1264  6                  ELSE ul := Exp(ul);
 1283  5                u2 := 0.25 * (k9 - 24.0);
 1303  5                IF u2 < 0.0
 1306  5                  THEN u2 := Minusexp(u2)
 1320  6                  ELSE u2 := Exp(u2);
 1337  5                g0 := c0*(Sin(g9)+g8*(u*u-Cos(g9)))
 1363  5                      /(1.0+g8*g8);
 1382  5                g7 := c0*(g8*(ul*ul+1.0))*u2*u2
 1408  5                      /(1.0+g8*g8);
 1430  5                IF g0 < g7
 1433  5                  THEN g0 := g7
 1440  6                END {then 2}
 1446  5              ELSE BEGIN {else 2}
 1449  5                t6 := hour+12.0*(1.0+Sgn(t4-hour))
 1476  5                      *Sgn(Abs(t4-hour));
 1494  5                g8 := pi * t9 / k9;
 1511  5                u  := 0.25 * (t4 - t6);
 1528  5                IF u < 0.0
 1531  5                  THEN u := Minusexp(u)
 1550  6                  ELSE u := Exp(u);
 1567  5                ul := -0.5 * k9 / t9;
 1585  5                IF ul < 0.0
 1588  5                  THEN ul := Minusexp(ul)
 1602  6                  ELSE ul := Exp(ul);
 1619  5                g0 := c0*(g8*(ul*ul+1.0))*u*u/(1.0+g8*g8)
 1663  5              END; {else 2}
 1667  4          END; {else 1}
 1667  3        g2 := (1.0+0.004*sunspot)*m9*Sqrt(6.0+58.0*Sqrt(g0));
 1713  3        u3 := k9 / 6.0 - 4.0;
 1733  3        IF u3 < 0.0
 1736  3          THEN u3 := Minusexp(u3)
 1750  4          ELSE u3 := Exp(u3);
 1767  3        g2 := g2 * (1.0 - 0.1 * u3 * u3);
 1796  3        g2 := g2*(1.0+(1.0-Sgn(olat)*Sgn(mylat))*0.1);
 1839  3        g2 := g2*(1.0-0.1*(1.0+(Sgn(Abs(Sin(10)))-Cos(10))));
 1883  3        IF g2 <= j9
 1886  3          THEN j9 := g2;
 1899  3        kl := kl + step;
 1909  3      UNTIL (kl >= test);
 1919  2      hourmuf := j9;
 1925  2
 1925  2    END; {hourmuf}
    0  1  {*
    0  1   * Compmuf - Computes MUF for each hour of the day specified.
    0  1   *           Stores result in global array provided.
    0  1   *}
    0  1
    0  1    PROCEDURE Compmuf(VAR path : text);
    0  1
    0  1    VAR
   0D  1      loopcount : integer;
  -2D  1      latl,lonl : real;
 -12D  1      lat2,lon2 : real;
 -22D  1      p,q,r,s   : real;
 -42D  1      k7,hour   : real;
 -52D  1
 -52D  1    BEGIN
    0  2      latl := olat * degtorad;
   15  2      lonl := olon * degtorad;
   28  2      lat2 := mylat * degtorad;
   41  2      lon2 := mylon * degtorad;
   54  2      p := Sin(lat2);
   62  2      q := Cos(lat2);
   70  2      r := Sin(latl);
   78  2      s := Cos(latl);
   86  2      k7 := r * p + s * q * Cos(lon2 - lonl);
  114  2
  114  2      Write(path, 'Crunching numbers ');
  128  2      Prompt(path);
  131  2      FOR loopcount := 1 TO 24 DO BEGIN
  145  3        hour := loopcount;
```

```
943   150  3        results[loopcount] := Hourmuf(lat1, lon1, lat2, lon2,
944   176  3                                p, q, r, s, k7, hour);
945   198  3        Write(path, '. ');
946   212  3        Prompt(path);
947   215  3      END;
948   229  2    END;
951     0  1 (*
952     0  1  * Showmuf - displays computation results on screen.
953     0  1  *)
954     0  1
955     0  1    PROCEDURE Showmuf(VAR path : text);
956     0  1
957     0  1    VAR
958    0D  1      loopcount : integer;
959   -2D  1      oft       : real;
960   -7D  1      hpf       : real;
961  -12D  1
962  -12D  1    BEGIN
963     0  2      Clrscrn(path);
964     6  2      Writeln(path, 'HOUR OFT(MHZ) MUF(MHZ) HPF(MHZ)');
965    19  2      FOR loopcount := 1 to 23 DO BEGIN
966    31  3        oft := 0.85 * results[loopcount];
967    57  3        hpf := 1.15 * results[loopcount];
968    83  3        Writeln(path, loopcount:3, '. ', oft:6:1,results[loopcount]:9:1,
969   129  3                hpf:9:1);
970   140  3      END;
971   152  2      oft := 0.85 * results[24];
972   173  2      hpf := 1.15 * results[24];
973   194  2      Write(path, ' 24. ', oft:6:1, results[24]:9:1, hpf:9:1);
974   238  2      Prompt(path);
975   241  2    END;
978     0  1 (*
979     0  1  * Graphmuf - display graph of OFT, MUF, & HPF on screen
980     0  1  *)
981     0  1    PROCEDURE Graphmuf(VAR path : text);
982     0  1
983     0  1    VAR
984    0D  1      loopcount, x, y : integer;
985   -6D  1
986   -6D  1    BEGIN
987     0  2      Owset(path, 1, 32, 0, 48, 24, 2, 0);
988    15  2      Curoff(path);
989    19  2      Scalesw(path, 0);
990    24  2      Setdptr(path, 16, 8);
991    30  2      Box(path, 376, 175);
992    40  2      FOR loopcount := 1 TO 5 DO BEGIN
993    50  3        x := (60 * loopcount) + 16;
994    57  3        Setdptr(path, x, 8);
995    63  3        Line(path, x, 175);
996    71  3      END;
997    83  2      FOR loopcount := 2 TO 10 DO BEGIN
998    93  3        y := 175 - Round(Log10(loopcount) * 100);
999   109  3        Setdptr(path, 16, y);
1000  115  3        Line(path, 376, y);
1001  123  3      END;
1002  135  2      FOR loopcount := 2 TO 4 DO BEGIN
1003  145  3        y := 175 - Round(Log10(10 * loopcount) * 100);
1004  163  3        Setdptr(path, 16, y);
1005  169  3        Line(path, 376, y);
1006  177  3      END;
1007  189  2      Curxy(path, 0, 1);  Write(path, '40'); Prompt(path);
1008  208  2      Curxy(path, 0, 3);  Write(path, '30'); Prompt(path);
1009  227  2      Curxy(path, 0, 5);  Write(path, '20'); Prompt(path);
1010  246  2      Curxy(path, 0, 9);  Write(path, '10'); Prompt(path);
1011  267  2      Curxy(path, 0, 13); Write(path, 'F5'); Prompt(path);
1012  288  2      Curxy(path, 0, 14); Write(path, 'R4'); Prompt(path);
1013  309  2      Curxy(path, 0, 15); Write(path, 'E');  Prompt(path);
1014  328  2      Curxy(path, 0, 16); Write(path, 'Q3'); Prompt(path);
1015  349  2      Curxy(path, 0, 17); Write(path, 'U');  Prompt(path);
1016  368  2      Curxy(path, 0, 18); Write(path, 'E2'); Prompt(path);
1017  389  2      Curxy(path, 0, 19); Write(path, 'N');  Prompt(path);
1018  408  2      Curxy(path, 0, 20); Write(path, 'C');  Prompt(path);
1019  427  2      Curxy(path, 0, 21); Write(path, 'Y1'); Prompt(path);
1020  450  2      Curxy(path, 0, 22);
1021  456  2      Write(path, ' 0      4      8      12      16      20      24');
1022  472  2      Prompt(path);
1023  475  2      Curxy(path, 0, 23);
1024  481  2      Write(path, '  HOUR   ');
1025  495  2      Prompt(path);
1026  498  2      y := 175 - Round(Log10(results[24]) * 100);
1027  525  2      Setdptr(path, 16, y);
1028  531  2      FOR loopcount := 1 TO 24 DO BEGIN
1029  545  3        x := 16 + (loopcount * 15);
1030  551  3        y := 175 - Round(Log10(results[loopcount]) * 100);
1031  581  3        Linem(path, x, y);
1032  587  3      END;
1033  601  2      Fcolor(path, $03);
1034  606  2      y := 175 - Round(Log10(0.85*results[24]) * 100);
1035  638  2      Setdptr(path, 16, y);
1036  644  2      For loopcount := 1 TO 24 DO BEGIN
1037  658  3        x := 16 + (loopcount * 15);
1038  664  3        y := 175 - Round(Log10(0.85*results[loopcount]) * 100);
1039  701  3        Linem(path, x, y);
1040  707  3      END;
```

Submitting Material To Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs that are useful/helpful/fun for other CoCo owners.

WHAT TO WRITE: We are interested in what you may wish to tell our readers. We accept for consideration anything that is well-written and has a practical application for the Tandy Color Computer. If it interests you, it will probably interest lots of others. However, we vastly prefer articles with accompanying programs which can be entered and run. The more unique the idea, the more the appeal. We have a continuing need for short articles with short listings. These are especially appealing to our many beginners.

FORMAT: Program submissions must be on tape or disk, and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs and debug our typing errors. All programs should be supported by some editorial commentary explaining how the program works. We also prefer that editorial copy be included on the tape or disk using any of the word processors currently available for the Color Computer. Also, please include a double-spaced printout of your editorial material and program listing. Do not send text in all capital letters; use upper- and lowercase.

COMPENSATION: We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

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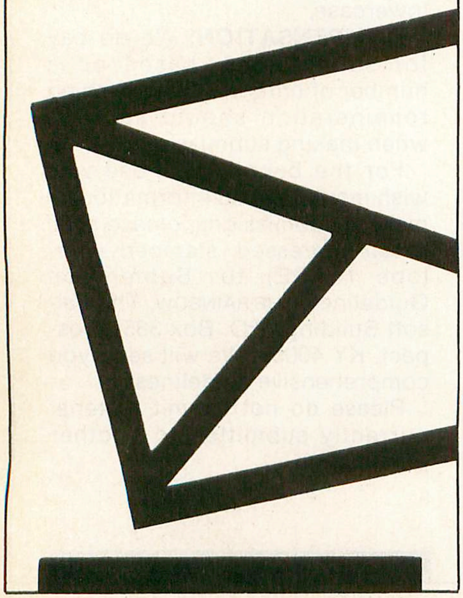

```
1041   721   2      Fcolor(path, $01);
1042   726   2      y := 175 - Round(Log10(1.15*results[24]) * 100);
1043   758   2      Setdptr(path, 16, y);
1044   764   2      For loopcount := 1 TO 24 DO BEGIN
1045   780   3        x := 16 + (loopcount * 15);
1046   786   3        y := 175 - Round(Log10(1.15*results[loopcount]) * 100);
1047   823   3        Linem(path, x, y);
1048   829   3      END;
1049   843   2      Fcolor(path, $02);
1050   848   2      Curon(path);
1051   852   2    END;
1110  1222   3        FOR loop2 := 1 TO 47 DO
1054     0   1 (*
1055     0   1  * Printmuf - print results on printer.
1056     0   1  *)
1057     0   1   PROCEDURE Printmuf(VAR path : text);
1058     0   1
1059     0   1   VAR
1060    0D   1     loop1, loop2 : integer;
1061   -4D   1     x, y         : integer;
1062   -8D   1     oft,hpf,muf  : real;
1063  -23D   1     graph        : ARRAY [1..80,0..48] OF char;
1064 -3943D  1
1065 -3943D  1   BEGIN
1066     0   2     Rewrite(path, printpath);
1067    12   2     Writeln(path); Writeln(path); Writeln(path); Writeln(path);
1068    48   2     Writeln(path, title); Writeln(path);
1069    78   2     Write(path, '      Prediction for:  ', name);
1070   102   2     IF (call[1] <> Chr(0)) THEN
1071   117   3       Write(path, ', ',call);
1072   141   2     Writeln(path);
1073   150   2     Write(path,'      Date:  ',day:2:0,' ',moname:3,'  ');
1074   202   2     Writeln(path,'SSN: ',sunspot:3:0,'  Flux: ',flux:3:0);
1075   251   2     Write(path,'      To:  ',ocntnt,' (',ocity,', ',ocntry,'), ');
1076   326   2     Writeln(path,'Lat: ',olat:6:2,'  Lon: ',olon:7:2);
1077   375   2     Writeln(path);
1078   384   2     Write(path,'      HOUR OFT(MHZ) MUF(MHZ) HPF(MHZ)');
1079   400   2     Writeln(path,'      HOUR OFT(MHZ) MUF(MHZ) HPF(MHZ)');
1080   421   2     FOR loop1 := 1 to 12 DO BEGIN
1081   435   3       loop2 := 12 + loop1;
1082   439   3       oft := 0.85 * results[loop1];
1083   465   3       hpf := 1.15 * results[loop1];
1084   491   3       Write(path,loop1:9,'. ',oft:6:1,results[loop1]:9:1,hpf:9:1);
1085   557   3       oft := 0.85 * results[loop2];
1086   583   3       hpf := 1.15 * results[loop2];
1087   609   3       Writeln(path,loop2:11,'. ',oft:6:1,results[loop2]:9:1,hpf:9:1);
1088   678   3     END;
1089   692   2     Writeln(path, Chr($13), Chr($1B), Chr($38));
1090   726   2     FOR loop1 := 0 TO 48 DO
1091   741   3       FOR loop2 := 1 TO 80 DO
1092   756   4         graph[loop2,loop1] := ' ';
1093   809   2     FOR loop1 := 0 TO 6 DO BEGIN
1094   823   3       y := 8 * loop1;
1095   827   3       FOR loop2 := 1 TO 80 DO
1096   842   4         graph[loop2,y] := '-';
1097   879   3     END;
1098   893   2     graph[1,0]  := '1'; graph[15,0] := '2'; graph[24,0] := '3';
1099   932   2     graph[30,0] := '4'; graph[35,0] := '5'; graph[39,0] := '6';
1100   973   2     graph[42,0] := '7'; graph[45,0] := '8'; graph[48,0] := '9';
1101  1015   2     graph[50,0] := '1'; graph[51,0] := '0'; graph[65,0] := '2';
1102  1060   2     graph[66,0] := '0'; graph[74,0] := '3'; graph[75,0] := '0';
1103  1102   2     FOR loop1 := 2 TO 10 DO BEGIN
1104  1116   3       x := Round(log10(loop1)*50);
1105  1128   3       FOR loop2 := 1 TO 47 DO
1106  1143   4         graph[x,loop2] := '|';
1107  1180   3     END;
1108  1194   2     FOR loop1 := 2 TO 3 DO BEGIN
1109  1208   3       x := Round(log10(10*loop1)*50);
1111  1237   4         graph[x,loop2] := '|';
1112  1274   3     END;
1113  1289   2     FOR loop1 := 1 TO 47 DO BEGIN
1114  1304   3       graph[1,loop1] := '|';
1115  1322   3       graph[80,loop1] := '|';
1116  1341   3     END;
1117  1355   2     graph[1,8]  := '4'; graph[1,16] := '8'; graph[1,24] := '1';
1118  1394   2     graph[2,24] := '2'; graph[1,32] := '1'; graph[2,32] := '6';
1119  1435   2     graph[1,40] := '2'; graph[2,40] := '0'; graph[1,48] := '2';
1120  1477   2     graph[2,48] := '4';
1121  1491   2     x := Round(log10(1.15*results[24])*50);
1122  1519   2     graph[x,0] := 'O';
1123  1539   2     graph[x,48] := 'O';
1124  1558   2     x := Round(log10(0.85*results[24])*50);
1125  1586   2     graph[x,0] := '#';
1126  1604   2     graph[x,48] := '#';
1127  1623   2     x := Round(log10(results[24])*50);
1128  1644   2     graph[x,0] := '*';
1129  1662   2     graph[x,48] := '*';
1130  1681   2     FOR loop1 := 1 TO 23 DO BEGIN
1131  1695   3       y := 2 * loop1;
1132  1699   3       graph[Round(log10(1.15*results[loop1])*50),y] := 'O';
1133  1753   3       graph[Round(log10(0.85*results[loop1])*50),y] := '#';
1134  1811   3       graph[Round(log10(results[loop1])*50),y] := '*';
1135  1858   3     END;
1136  1872   2     FOR loop1 := 0 TO 48 DO BEGIN
```

```
1137  1887  3        FOR loop2 := 1 TO 80 DO
1138  1902  4          Write(path, graph[loop2,loop1]);
1139  1949  3        Writeln(path);
1140  1958  3      END;
1141  1972  2      Writeln(path, Chr($1B), Chr($36), Chr($14));
1142  2006  2      Page(path);
1143  2009  2      Close(path);
1144  2012  2    END;
1147     0  1 (*
1148     0  1  * Doagain - is another prediction desired?
1149     0  1  *)
1150     0  1    PROCEDURE Doagain(VAR path : text);
1151     0  1
1152     0  1    BEGIN
1153     0  2      Write(path, 'Do another MUF prediction (Y/N)?  ');
1154    14  2      Prompt(path);
1155    17  2      Reset(path);
1156    27  2      Readln(path, answer);
1157    37  2      Rewrite(path);
1158    47  2    END;
1161     0  1 BEGIN
1162     0  1    mo[1]  := 31; mo[2]  := 28;
1163    69  1    mo[3]  := 31; mo[4]  := 30;
1164    91  1    mo[5]  := 31; mo[6]  := 30;
1165   113  1    mo[7]  := 31; mo[8]  := 31;
1166   135  1    mo[9]  := 30; mo[10] := 31;
1167   157  1    mo[11] := 30; mo[12] := 31;
1168   179  1    moarray[1]  := 'JAN'; moarray[2]  := 'FEB';
1169   205  1    moarray[3]  := 'MAR'; moarray[4]  := 'APR';
1170   231  1    moarray[5]  := 'MAY'; moarray[6]  := 'JUN';
1171   258  1    moarray[7]  := 'JUL'; moarray[8]  := 'AUG';
1172   284  1    moarray[9]  := 'SEP'; moarray[10] := 'OCT';
1173   310  1    moarray[11] := 'NOV'; moarray[12] := 'DEC';
1174   336  1    printout := FALSE;
1175   341  1
1176   341  1    Rewrite(screen, window);
1177   353  1    Dwset(screen, 7, 0, 0, 80, 24, 0, 1, 1);
1178   368  1    Font(screen, 200, 1);
1179   378  1    Select(screen);
1180   384  1
1181   384  1    Logo(screen);
1182   390  1    Header(screen);
1183   396  1    Writeln(screen, 'Initializing program ...');
1184   411  1    Init;
1185   414  1    REPEAT
1186   414  1      Menu(screen);
1187   420  2      Getdat(screen);
1188   426  2      Askabort(screen);
1189   432  2    UNTIL ((answer = 'Y') OR (answer = 'y'));
1190   448  1    Wantprnt(screen);
1191   454  1    Compmuf(screen);
1192   460  1    Showmuf(screen);
1193   466  1    Graphmuf(screen);
1194   472  1    IF printout THEN
1195   478  2      Printmuf(printer);
1196   484  1    Doagain(screen);
1197   490  1    Owend(screen);
1198   496  1    WHILE ((answer = 'Y') OR (answer = 'y')) DO BEGIN
1199   515  2      REPEAT
1200   515  2        Header(screen);
1201   521  3        Write(screen, 'Use same geographic area for prediction (Y/N)  ');
1202   533  3        Prompt(screen);
1203   538  3        Reset(screen);
1204   550  3        Readln(screen, answer);
1205   562  3        Rewrite(screen);
1206   574  3        IF ((answer = 'N') OR (answer = 'n')) THEN
1207   590  4          Menu(screen);
1208   596  3        Write(screen, 'Use same date and Sunspot/Flux number (Y/N)?  ');
1209   608  3        Prompt(screen);
1210   613  3        Reset(screen);
1211   625  3        Readln(screen, answer);
1212   637  3        Rewrite(screen);
1213   649  3        IF ((answer = 'N') OR (answer = 'n')) THEN
1214   665  4          Getdat(screen);
1215   671  3        Askabort(screen);
1216   677  3      UNTIL ((answer = 'Y') OR (answer = 'y'));
1217   693  2      Wantprnt(screen);
1218   699  2      Compmuf(screen);
1219   705  2      Showmuf(screen);
1220   711  2      Graphmuf(screen);
1221   717  2      IF (printout) THEN
1222   723  3        Printmuf(printer);
1223   729  2      Doagain(screen);
1224   735  2      Owend(screen);
1225   741  2    END;
1226   744  1 END.
PROC NAME        PSEC  PSIZE  LOCAL  STACK   CSEC  CSIZE
   0 SKIPMUF       74    761    821     25     77    211
   1 DWSET          1     86      2     12      2      0
   2 FONT           2     38      2     12      3      0
   3 SELECT         3     21      2     12      4      0
   4 OWSET          4     78      2     12      5      0
   5 CUROFF         5     21      2     12      6      0
   6 SCALESW        6     28      2     12      7      0
   7 SETDPTR        7     74     10     12      8      0
   8 BOX            8     74     10     12      9      0
   9 LINE           9     74     10     12     10      0
  10 CURXY         10     41      2     12     11      0
  11 LINEM         11     74     10     12     12      0
  12 FCOLOR        12     28      2     12     13      0
  13 CURON         13     21      2     12     14      0
  14 OWEND         14     21      2     12     15      0
  15 LOG10         16    137     17     17     17      0
  16 NORM          15     76      2     17     16      0
  17 CLRSCRN       17     20      2     13     18      0
  18 LOGO          18    234     32     15     19    354
  19 HEADER        21     26      4     15     22     54
  20 INIT          23    292      4     18     25     12
  21 MENU          26    967     36     19     30    117
  22 GETDAT        31    712     36     22     34    459
  23 ASKABORT      36    291     20     16     38    125
  24 WANTPRNT      39     75      5     15     40     54
  25 HOURMUF       46   1927    160     17     54      0
  26 ACS           41     39      5     27     42      0
  27 RPOWER        42     49      5     17     43      0
  28 CHECKVAL      43     68      0     18     44      0
  29 SGN           44     76      5     17     45      0
  30 MINUSEXP      45     41      5     27     46      0
  31 COMPMUF       54    230     58     39     55     22
  32 SHOWMUF       56    242     18     16     57     41
  33 GRAPHMUF      58    853     38     23     62     86
  34 PRINTMUF      63   2013   3983     18     71    231
  35 DOAGAIN       72     48      4     15     73     55
                         9856   5320    594           1821

1226 Lines of source code compiled with no errors found

 Actual Heap = 7863
Actual Stack = 4428
 Free Memory = 3657
```

Hint . . .

Handy Work Window

Using the overlay window command, `OWSET`, in a couple of short procedures, a "work window" can be opened over the top of OS-9 or BASIC09 screens where there is work underway. Such a nondestructive window takes on the characteristics of the window it overlays — that is, it opens with either the OS-9 or the BASIC09 prompt. BASIC09 is used to create the two procedures:

```
PROCEDURE ww
RUN gfx2("OWSET",1,2,2,30,
20,2,0)
RUN gfx2("BOLDSW","ON")
PRINT"Work window. . ."
RUN gfx2("BOLDSW","OFF")
END

PROCEDURE qww
RUN gfx2("OWEND")
END
```

The procedures are then saved under the name of the first: `save* ww`, and subsequently packed: `pack* ww`.

The final step is to edit the startup file by adding `load ww` to whatever else is found in it. On a 512K machine, `runb` and `gfx2` should also be added to `startup` to get quick response from the work window call. At the OS-9 prompt you merely type `ww` and press ENTER, or type `qww` and press ENTER to exit to your main window. If at the BASIC09 prompt, then `$ww` or `$qww` would be needed.

Del Turner
Kamloops, BC

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Gainesville	Paper Chase
Jacksonville	Book Co.
North Miami Beach	Almar Bookstore
Panama City	Boyd-Ebert Corp.
Pensacola	Anderson News Co.
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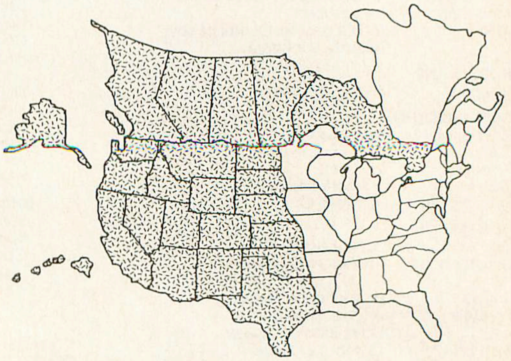

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- **Data Merge capability** to interface with our OS-9 Text Formatter – perfect for using data master information imbedded in letters, forms, and more!
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Data Master

by BJ Chambless

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Reports:

See your data any way you want by designing your own reports! Data Master offers easy-to-use tools to design professional reports including report headings, titles, column headings, automatic page numbers, column totals, and more. Store up to 9 report formats for each data base.

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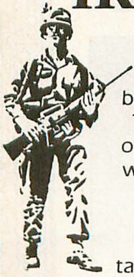
IRON CROSS

by John & Michael Galus



The German invasion of Russia began at 0300 on 22 June 1941. Two massive armies faced each other in a titanic struggle which would decide World War II. The object of IRON CROSS is to defeat the Russian forces controlled by the computer & to take control of the Russian cities.

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by Scott Cabit

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- **Pop-Up Help Menus** are as close as a keystroke.
- **Closing Commands** let you exit the editor with or without save, and can import or export files whenever you need them.
- **Smart Speller** is included.
- **Parameter commands** personalize your environment.
- **Access the OS-9 Shell.**
- **Up to 10 functions keys** can be defined by CoCo 3 users for fast, repetitive functions.
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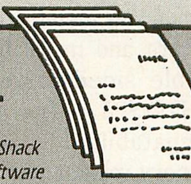
- **Level 1 & Level 2** are supported and both versions are included.

Requires OS-9 Disk $49.95
With Text Formatter $74.95

OS-9 Text Formatter



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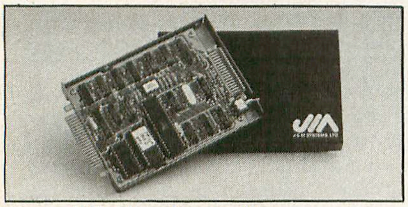

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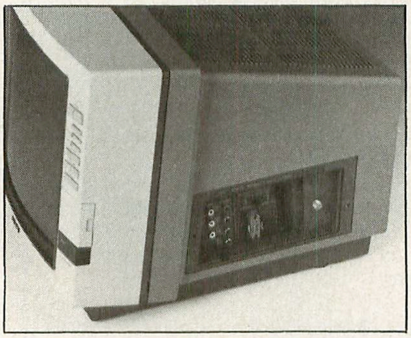

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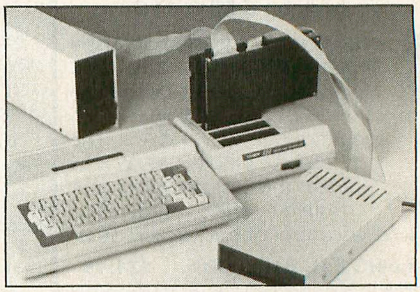

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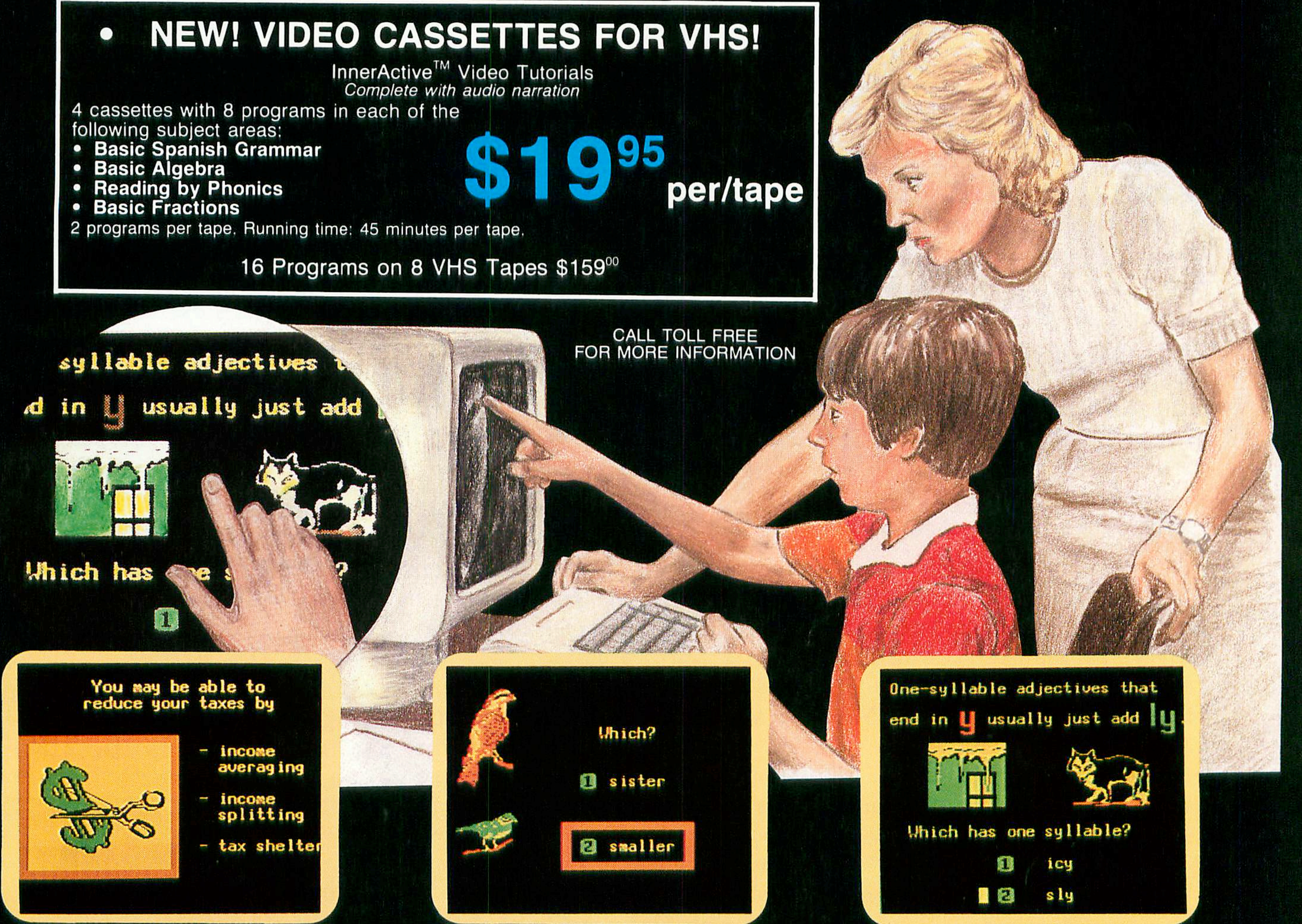

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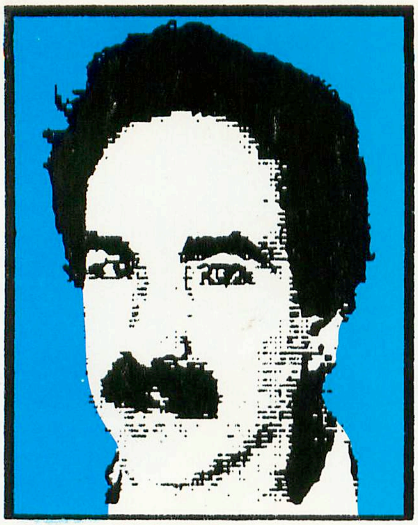

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